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UNITED STATES ATOMIC ENERGY COMMISSION

Nuclear Science Abstracts

Covering the Literature on Atomic Energy
in the Fields of

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Vol. 5 No. 22
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Indexes

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Each issue of Volume 5 (1951) contains an Author index and a current supplement to the cumulative Numerical Index of AEC Reports. The sixth, twelfth, and eighteenth issues have Subject and Author indexes cumulated for the preceding three months. The 24th issue will be the "Cumulative Index" for the year.

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NUCLEAR SCIENCE ABSTRACTS

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ERRATA

NSA Vol. 4, No. 3. In abstract 707, AECU-657 should be AECU-651.

NSA Vol. 4, No. 13. In abstract 4061, the author now attributes the resonance peak to Rb^{87} impurity instead of to Pr.

NSA Vol. 5, No. 18. In title of UCRL-1316, p.vii, and in abstract 4714, the Roman numeral XVII should be XVIII.

NSA Vol. 5, No. 19. In abstract 5042, AECU-1433 should be AECU-1452.

NSA Vol. 5, No. 19. In abstract 5423, after (AECU-1386) add (For abstract, see NSA 5-3544).

NSA Vol. 5, No. 21. In abstract 6144, the names of the authors, Lyle J. Hals, Thomas S. Reid, and George H. Smith, Jr., were omitted from the descriptive cataloging.

NSA Vol. 5, No. 21. In abstract 6177, the name of the author, H. S. Turner, was omitted from the descriptive cataloging.

NSA Vol. 5, No. 21. In abstract 6256, the name of the author, J. B. Swan, was omitted from the descriptive cataloging.

NSA Vol. 5, No. 21. In abstract 6385, the name of the author, A. H. Wapstra, was omitted from the descriptive cataloging.

NSA Vol. 5, No. 21. In abstract 6412, the author, Franz R. Meitzger should be Franz R. Metzger.

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RMO-797	Annual Report for July 1, 1950, to June 30, 1951. Paul F. Kerr, T. P. Anderson, C. A. Rasor, R. J. Pill, P. K. Hamilton, H. Wright, and W. J. Cohen.	6779
SO-2018	Fundamental Research in Physical Metallurgy; Eleventh Quarterly Report (Progress Report Number 28). J. H. Hollomon and D. Turnbull.	6754
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UCRL-1208	Summary of the Research Progress Meeting of March 22, 1951. Bonnie E. Cushman.	6851
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NP-3378	Gem- and Lithium-bearing Pegmatites of the Pala District, San Diego, California (Special Report No. 7-A). Richard H. Jahns and Lauren A. Wright.	6787
NP-3390	Nuclear Shielding Studies; XII. A Quadrature Method for Computing Neutron Distributions in Two Dimensions (Technical Report No. 52). E. L. Secrest.	6888
NP-3391	Progress Report; August 31, 1951.	6792
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TEM-97A	Progress Report; Colorado Front Range Area.	6783

GENERAL

ATOMIC POWER

6554

POWER INDUSTRY'S ROLE IN ATOMIC-ENERGY DEVELOPMENT. Philip Sporn, E. W. Morehouse, and Walton Seymour. Mech. Eng. 73, 702-5, 708(1951) Sept.

The text of the report of the Ad Hoc Advisory Committee on Cooperation between the Electric Power Industry and the Atomic Energy Commission, submitted to the Commission on Mar. 28, 1951, and released for publication June 22, 1951, is presented with certain appendixes on terms of reference omitted. The power industry's interest in atomic power, areas of mutual interest to the power industry and AEC, and a program of continuing cooperation are discussed.

RESEARCH PROGRAMS

6555

MAJOR ACTIVITIES IN THE ATOMIC ENERGY PROGRAMS January-June 1951. Washington, D.C., U. S. Government Printing Office, July 1951. 151p.

A comprehensive summary of AEC progress in weapons testing and other military applications, raw material procurement, production, reactor development, research programs, labor relations, finance and business management, and security operations is presented. Appendixes list the principal staff personnel and members of committees, research centers, isotope distributions, and current research contracts, and report policies and regulations of AEC on procurement, radioisotope distribution, and domestic ore program. The report to the President by the Atomic Energy Labor Relations Panel for Dec. 1, 1950, to June 1, 1951, is included.

BIOLOGY AND MEDICINE

6556

Atomic Energy Project, Univ. of Rochester

A NEW PNEUMOTACHOGRAPH AND ITS APPLICATION TO A STUDY OF HUMAN AND CANINE RESPIRATION; by Paul E. Morrow. Aug. 29, 1951. 113p. (UR-182)

A new pneumotachographic instrument is described. The operating assembly includes a portable, capacitance-modulated, high-frequency oscillator which is capable of detecting with high sensitivity the air-flow velocities occurring in normal and altered respiratory states. Studies with the pneumotachograph have been made on human and canine subjects under normal conditions, under certain stress conditions, and under the influence of several drugs. The flow-velocity data were analyzed in a number of ways, and the interrelationships of various parameters were determined In addition to the kinetic data, volumetric measurements were obtained by integrating the flow-velocity curves. Reproductions of many human and canine pneumotachograms are presented. Complete circuit diagrams and photographs of the pneumotachographic assembly are also included. (auth)

6557

Sloan-Kettering Inst. for Cancer Research

THE BASIC PROTEINS OF ASPERGILLUS FUMIGATUS WITH TUMOR-INHIBITING PROPERTIES; by Mary L. Petermann, Mary G. Hamilton, and H. Christine Reilly. [nd] 21p. (AECU-1657)

The factor in culture filtrates of Aspergillus fumigatus responsible for tumor inhibition in mice was purified by ethanol fractionation and electrophoretic separation. It was concluded that both the tumor-inhibiting factor and the toxicity factor are properties of a single basic protein.

6558

Philadelphia General Hospital

INFRARED SPECTROSCOPY OF TISSUES; by Henry P. Schwarz, Helena E. Riggs, Charles F. Glick, W. Cameron, E. Beyer, B. Jaffe, and L. Trombetta. [nd] 8p. (AECU-1650)

A method for infrared spectroscopy of tissues for signs of disordered function is described. Results of infrared spectroscopy of various tissues, frozen and dried at low temperatures, from animals in insulin shock and in control animals are reported in detail. The constancy and reproducibility of spectra of tissue was found to be suprisingly high and the similarity of tissue spectra for different species was demonstrated. The ratios between the optical densities of internal standard and characteristic absorption spectra were determined in control animals and animals in insulin shock. These ratios showed only slight variations in control animals but differences exceeding by far the normal variations were found in brain sections from animals in insulin shock. It is concluded that this method has value for physiologic and pathologic studies of tissues.

6559

ON THE SPECIFICITY OF HYPERVOLEMIA AND CONGESTIVE CHANGES IN TUMOR-BEARING MICE. Jacob Furth and Jack Moshman. Cancer Research 11, 543-51(1951) July.

A comparative study of plasma and cell volumes and congestive changes in estrogen-secreting granulosa tumors and several nonhormone-secreting neoplasms is reported.

6560

THE FIRST TWO STEPS OF THE INVASION OF HOST CELLS BY BACTERIAL VIRUSES. II. Alan Garen and Theodore T. Puck, Ph.D. J. Exptl. Med. 94, 177-89(1951) Sept.

Data indicate that virus invasion of host cells consists of an initial, reversible attachment whose properties are those to be expected from the operation of electrostatic binding forces. The step is followed by an enzymatic transformation which is irreversible, strongly temperature-dependent, and, in the case of T1 virus, susceptible to inactivation by ultraviolet radiation.

6561
A METHOD FOR THE DETERMINATION OF SMALL DOSES OF I-131 IN THE URINE. W. E. Goodwin and W. D. Harris. J. Lab. Clin. Med. 38, 470-3(1951) Sept.

A method is described using a scintillation counter to determine urinary excretion of tracer doses of I^{131} by measuring γ radiation of the liquid sample. Absorption, pipetting, and drying errors are prevented by such use, and an administered dose as small as one microcurie can be detected.

6562
THE EFFECT OF THYROTROPIN ON THE RELEASE OF HORMONE FROM THE HUMAN THYROID. Richard E. Goldsmith, John B. Stanbury, and Gordon L. Brownell. J. Clin. Endocrinol. 11, 1079-94(1951) Oct.

The administration of 1-methyl-2-mercaptoimidazole caused an increase of the biologic decay rate of previously fixed labeled iodine from the thyroids of 3 of 6 thyrotoxic subjects. The effectiveness of the drug in increasing the excretion of a tracer dose of radioactive iodine was demonstrated in all cases. The additional administration of thyrotropin caused an increase or a further increase in the biologic decay rate in all 6 subjects. Thus, thyrotropin causes an increased release of thyroid hormone independently of, and in addition to, its effect on iodide accumulation. With one exception the thyrotropin caused no aggravation of the thyrotoxicosis in these 6 subjects who were under the influence of a potent antithyroid drug. Various implications of these results are discussed. (auth)

RADIATION EFFECTS

6563
Atomic Energy Project, Univ. of Rochester
NEOPLASIA INDUCED IN RAT EMBRYOS BY ROENTGEN IRRADIATION; by James G. Wilson, Robert L. Brent, and H. Charles Jordan. Sept. 5, 1951. 30p. (UR-183)

Rat embryos x-irradiated on the 9th day of gestation developed discrete tumor-like growths in and around the brain. The incidence of such tumors was directly related to the dosage of x rays. They first appeared on the 2nd day after irradiation and thereafter exhibited varying capacities for growth and differentiation. Some grew for 1 or 2 days and then disappeared as a result of dispersal of the cells, others grew rapidly until the 5th and 6th postirradiation day and then became atrophic, and still others continued to grow slowly until the 7th or 8th day and then became static or underwent atrophic regression. Few remained in term animals and these were small and gave no evidence of proliferative activity. Although the tumor-bearing animals had a somewhat higher mortality than the nonirradiated controls, neither prenatal nor postnatal death could be attributed to the presence of the tumors. (auth)

6564
Brookhaven National Lab.
SOME CYTOLOGICAL AND MORPHOLOGICAL CHANGES INDUCED IN PLANTS BY IONIZING RADIATION; by Arnold H. Sparrow. [nd] 1p. (AECU-1645)

The report is reproduced here in its entirety.

Several species of plants have been exposed to chronic gamma irradiation from Co^{60} for periods up to four months. There was considerable variation in the radiosensitivity of different species, but in one instance no significant effect was detectable after 2000 r per day for six weeks. Generally, however, much lower dosages were sufficient to produce one or more characteristic morphological responses. These included, in addition to growth inhibition, some fasciation and various unusual shapes and sizes of leaves of reproductive structures. Hypertrophic growth in certain structures was frequently produced in some species. In others tumor-like growths as well as somatic mutations were observed. In Tradescantia paludesa a dramatic increase in the number of both vegetative and flower buds was noted after chronic irradiation of about 30 r per day.

Cytological observations were made on both meiotic and somatic cells of irradiated T. paludesa. The expected types of chromosomal aberrations were found and their frequency in both tissues determined. Meiotic chromosomes were shown to be much more radiosensitive than chromosomes of somatic cells. This agrees with the observation that pollen sterility and morphological abnormalities in the anthers occur at dosages which have relatively little gross effect on somatic tissue.

Dosages which caused marked morphological changes also produced a considerable amount of chromosomal aberration. However, since recovery to a normal growth pattern occurred in many plants which had previously shown severe radiation damage, it would seem that most of the morphological aberrations were not of a genetic nature. It is considered that they were probably the result of radiation induced physiological changes, although the possibility that they are somehow related to chromosomal aberrations cannot yet be excluded.

6565
Argonne National Lab.
A PHASE CONTRAST MICROSCOPY STUDY OF X-RAY INDUCED PYCNOSIS IN THE LIVING CELL; by Theodore N. Tahmisian and Dorothy M. Adamson. Sept. 1951. 16p. (AECU-1663; UAC-436)

An abstract of this report appeared in Anat. Record 108, 572-3(1950) Nov. and in Nuclear Science Abstracts as NSA 5-1464.

6566
RECOVERY PATTERN OF THE BLOOD PICTURE IN GUINEA PIGS FOLLOWING A LIMITED TOTAL BODY EXPOSURE TO CHRONIC GAMMA RADIATION. Egon Lorenz. J. chim. phys. 48, 264-74(1951) May-June.

The recovery pattern of chronically γ-radiation exposed guinea pigs is presented in detail. Inbred guinea pigs were given 8.8 r daily until the number of erythrocytes in the peripheral blood decreased to approximately 2.8 million cells per mm (normal 5.7 $\pm$ 1.2 million). Data on guinea pigs indicate a sensitivity of the hematopoietic system comparable to that of man. Complete data on the blood picture and bone marrow studies are presented.

6567
ANALOGOUS EFFECTS OF RADIATION AND TRYPAN BLUE ON RATS RESISTANT TO TRANSPLANTED HEPATOMA. Annabelle Cohen and Lionel Cohen. Nature 167, 1063(1951) June 30. (Letter to the editor)

Liver carcinomas induced in rats by butter yellow were transplanted into the subcutaneous tissues of young animals of the same strain. In a high percentage of cases the tumors grew for about 2 weeks and then rapidly regressed to small, barely palpable nodules. The rats were then divided into 4 groups. One group was treated with total-body irradiation, the second with trypan blue, the third with butter yellow, and the fourth group served as controls. In both the irradiated group and that receiving trypan blue injection, the tumor remnants recommenced growing vigorously and progressively in every case, and in the ensuing 4 months they ulcerated through the skin. An additional feature was the

tendency in both groups to chronic infection and infestation. Both the group on the butter-yellow diet and the untreated control group showed none of the infective features, and exhibited complete regression of the nodules with no recurrences during a 6-month observation period.

6568

RESULTS AND PROBLEMS OF THE TARGET THEORY IN RADIOBIOLOGY. K. Sommermeyer. Naturwissenschaften 38, 289-98(1951) July.

The only assumption made by the target theory is that radiation absorption in biology follows the laws of the quantum theory, the aim of which is to find the relationships between the primary reactions of the ionization radiation with the biological target and the ultimate total biological effect. Statistical experiments serve as fundamental application of the theory. Examples given of experiments with high-energy radiation show dependence of target numbers on dosage and ionization distance (from primary reaction to ultimate path in the radiosensitive medium). Experiments with primary biological structures such as viruses, phages, genes, and chromosomes are reviewed; dependence of radiation effects on the size of these bodies is shown; radiation effects (inactivation, chromosome aberrations) decrease with bodies of increasing size under the same strength of radiation. The biochemical foundations of these reactions are analyzed in detail. Reviews of target-number computations for ionization-radiation effects on higher organisms are given for bean seedlings and eggs of Drosophila. The relationship of radiosensitive volume and indirect ionization-radiation reactions, the safety in using exponential curves resulting from experiments in target number computations, and the energy distribution of the primary ionizations and their dependence on the energy of the ionized particles are discussed. Experiment with the kapazitron investigate the ionization-radiation effectiveness of particles of various energies on primary biological structures of larger size.

6569

GENETIC, EMBRYOLOGIC, AND NEONATAL PROBLEMS RELATED TO IONIZING RADIATIONS OF INTEREST TO VETERINARIANS. John H. Rust. J. Am. Vet. Med. Assoc. 119, 103-7(1951) August.

A summary is given of results of experiments to study the effects of ionizing radiation on amphibia, fruit flies, and small laboratory animals, and results of these studies are extrapolated to larger animals.

6570

ATOMIC BOMB INJURY: RADIATION. Charles L. Dunham, Eugene P. Cronkite, George V. LeRoy, and Shields Warren. J. Am. Med. Assoc. 147, 50-4(1951) Sept. 1.

The syndrome of acute radiation injury which is found following exposure of the whole body, or a major portion of it, to the initial nuclear radiation of an atomic bomb is described. A clinical classification of the syndrome, criteria for clinical diagnosis of radiation injury, recommended therapy of radiation injury, and criteria for predicting prognosis of those who have survived several hundred roentgens of whole body radiation, are given.

6571

COMPARATIVE EFFECTS OF THERMAL NEUTRON IRRADIATION OF MAIZE POLLEN AND MAIZE SEED ON SUBSEQUENT SEEDLING GROWTH. John W. Schmidt and E. F. Frolik. J. Heredity 42, 173-7(1951) July-Aug.

On the basis of x-ray comparisons, thermal neutrons were ~6 to 12 times as effective on maize seed as on maize pollen in reducing subsequent seedling height. Even if allowance is made for the greater amount of ionization produced in seed than in pollen by equal doses of thermal neutrons, there is still a large difference in the efficiency of these particles on the two plant parts (on the basis of x-ray comparisons). It is, therefore, suggested that ionization alone may not account for all of the biological effects of thermal neutrons and that transmutation of N to C and/or B to Li may also contribute to the biological effects. The susceptibility of maize pollen and maize seed to thermal neutrons was determined through the effects on the subsequent seedling development.

6572

A STUDY OF GENETIC EFFECTS OF COSMIC RADIATION ON COTTON SEED. Govan N. Stroman and Thomas H. Lewis. J. Heredity 42, 210-13(1951) July-Aug.

Samples of seed from individual cotton plants known to be heterozygous for certain seedling defects were exposed to high-altitude radiation in an experimental type V-2 rocket. An altitude of 90.5 miles was reached during 595.5-sec flight. The exposed seed were grown through the second generation against controls from the same parent plants. Changes noted in the radiated material remain to be finally evaluated, and cannot as yet be designated as cosmic radiation effects.

6573

THE DEVELOPMENT OF SECONDARY TAILS IN YOUNG AXOLOTLS AFTER LOCAL X-RAY IRRADIATION. V. V. Brunst and Frank H. Figge. J. Morphol. 89, 111-33(1951) July.

High doses of x radiation (600 to 1200 r) applied to localized areas of tails of Axolotls, 10 days after their hatching, "stimulated" the formation of secondary tails. The induced cartilaginous skeletons were at first totally independent of the normal cartilaginous elements. Growth of the normal tails may be inhibited by x radiation.

6574

OBSERVATIONS UPON THE LYMPHOPENIA OF X-RAY IRRADIATION; PART II. C. H. G. Price. Brit. J. Radiology 24, 556-67(1951) Oct.

In experiments in which three groups of albino rats were exposed to fractional doses of 95 kv X rays it has been confirmed that the total lymphocyte count is related to the total dose of radiation administered. It has also been confirmed that the lymphocyte survival/dose curve is of a double exponential form. On comparison of the mean total lymphocyte survival/dose curves of the three groups of animals it could be shown: (a) That the degree of the biological change was more readily affected by an alteration in the volume of tissue irradiated than by a change in the rate of dosage of radiation. (b) That with suitable arrangement the regenerative effect of formative tissues could be demonstrated. (c) That on analysis of the total lymphocyte survival/dose curves into two separate components, the major effect was best explained as the direct result of the ionizing radiation, which effect can be regarded as a single hit target phenomenon. On a group basis there was evidence to show that the integral dose and concomitant change could be correlated with the observed group tolerance of the animals. This was not, however, apparent on consideration of the individual animal. (auth)

6575

EFFECTS OF ANTISPLENIC TISSUE SERUM ON ROENTGEN-RAY DAMAGE (WHOLE BODY IRRADIATION). Norman Molomut, Milton Friedman, Irene Jacob Ryby, and Alvin Harber. Am. J. Roentgenol. Radium Therapy 66, 245-7(1951) Aug.

The effect of antispleen serum upon recovery of mice from damage to the reticulo-endothelial system caused by whole-body x irradiation was investigated. Under the conditions used, antispleen serum did not affect the increased susceptibility of x-irradiated mice to infection with Rickettsia pox.

6576

MAMMARY-TUMOR INCIDENCE IN FEMALE C_3Hb MICE FOLLOWING LONG CONTINUED GAMMA IRRADIATION. Egon Lorenz, Allen B. Eschenbrenner, Walter E. Heston, and Delta Uphoff. J. Natl. Cancer Inst. 11, 947-61(1951) Apr.

Virgin C_3Hb mice were chronically irradiated over the total body with 8.8 r daily (8 hr) of γ radiation from a $RaSO_4$ source beginning at 1 month of age and continuing throughout their entire life span. Mean survival time of irradiated animals was shortened by 36% in comparison to nonirradiated controls. The injurious action of the irradiation was evidenced by a considerable reduction in weight after 1 yr of age. Of the animals 47% developed tumors of the mammary gland, 88% ovarian tumors, and 36% lymphoid tumors. Pulmonary tumor and hepatoma incidences were also increased in experimental animals in comparison to nonirradiated controls. Physiological and hormonal factors involved are discussed.

6577

DEPENDENCE OF THE HUMAN SKIN REACTION PRODUCED BY IONIZING RADIATION UPON THE TYPE OF RADIATION. C. W. Wilson. Radiology 57, 83-9(1951) July.

Speculations based on the assumption that the human skin reaction to ionizing radiation has its basic cause in the production of chromosome abnormalities arising from chromosome breakage are presented. The physical basis of the production of chromosome abnormalities is discussed. The effects produced by radiations of different quality or kind on Tradescantia are described and extrapolation made to human skin. The dependence of the number of chromatid breaks in Tradescantia upon x-ray wavelength is pointed out, and chromatid breakage by neutrons is discussed. Effects upon human skin produced by fast protons is postulated.

6578

SUCCESSFUL SUBCUTANEOUS GROWTH AND TRANSPLANTATION OF HUMAN TUMORS IN X-IRRADIATED LABORATORY ANIMALS. Helene Wallace Toolan. Proc. Soc. Exptl. Biol. Med. 77, 572-8(1951) July.

Of 100 human neoplasms implanted subcutaneously in x-irradiated rats and mice as sieved or minced cell suspensions, 33 had no mitotic cells at the end of the first generation (8 days), 34 showed cellular proliferation at the end of the first generation but could not be transferred successfully to a second, and 33 were transplanted for 2 generations or more with evidence of active growth and vascularization. Epidermoid carcinomas were most successfully propagated.

6579

ON THE NATURE OF RETINAL EXCITATION BY X RAYS. Vasco Ronchi. Atti fondazione "Giorgio Ronchi" 6, 221-4 (1951) Aug. (In Italian)

An account is given of the results obtained by Bellucci (Giorn. ital. oftalmologia 4, No. 4, 249(1951)) in his recent investigations on the retinal excitation induced by x rays, and, in particular, of the patterns that are seen when an eye is exposed to a very narrow or very flat beam of x rays. The nature of the said excitation is also discussed, and some arguments are put forward, on the strength of which the hypothesis of a fluorescence of the retinal substance appears more reasonable than that of a direct excitation: this in spite of the experiments which have led Bellucci to the opposite conclusion. (auth)

6580

THE BORON AND LITHIUM CONTENT OF HUMAN BONES. George V. Alexander, Ralph E. Nusbaum, and Norman S. MacDonald. J. Biol. Chem. 192, 489-96(1951) Oct.

Spectrographic analyses for boron and lithium were made on 116 ashed samples of bone from 33 human individuals. The values found for boron ranged from 16 to 138 ppm, by weight, with a mean of 61 and a standard error of ± 1.7 ppm. No lithium was found in any of the specimens, although 11 ppm of lithium could be detected by the technique. Computations of the kinetic energy which would be liberated within bone tissue upon exposure to thermal neutrons were made. Though normally present in small quantity, by virtue of its large capture cross-section boron would contribute significantly to the total amount of ionizing radiation generated by neutron capture processes. The magnitude of this quantity of energy would be about 1.3 times that arising from the capture of neutrons by the nitrogen present in the bone. Although lithium also possesses a large capture cross-section, the amounts present in normal bone would give rise to less than 6% of the energy attributable to the nitrogen content.

6581

ADENOSINE TRIPHOSPHATE LEVELS IN MOUSE BLOOD AFTER WHOLE-BODY IRRADIATION AND DURING TUMOR GROWTH. Paul A. Zahl and Harry G. Albaum. Proc. Soc. Exptl. Biol. Med. 77, 388-93(1951) July.

No changes were observed in the blood levels of total nucleotide or of adenylic acid, adenosine diphosphate, or adenosine triphosphate during the wasting period following whole-body x irradiation of mice. Massive injected doses of adenosine triphosphate (ATP) failed to induce overt symptoms of shock in mice. In mice with implanted tumors there was found a continuous decrease in blood ATP until about the 10th postimplantation day, followed by a rise of ATP. The decrease paralleled the increase in tumor weight. No significant changes were observed in total nucleotide values for blood during tumor growth, nor was the adenylic acid or the adenosine diphosphate picture different from that for normal mice.

6582

EXPERIMENTAL STUDIES ON EARLY LENS CHANGES AFTER ROENTGEN IRRADIATION. Ludwig Von Sallmann and Beatrice D. Locke. Arch. Ophthalmol. (Chicago) 45, 431(1951).

A review of this article appears in Surg. Gynecol. Obstet. 93, 335(1951) Oct. and is reproduced here in part. Experiments with radioactive tracers, such as radiosodium, confirmed the results of previous studies with other indicators by demonstrating an increased permeability of the blood-aqueous barrier up to 6 weeks after irradiation of the rabbit's eye with 2000 r. This occurrence, however, did not seem to play an integral part in the pathogenesis of radiation cataract. The absorption of radiosodium by lenses with radiation cataract was greater than that by control lenses. This phenomenon increased with the progress of the cataractous process. The accumulation of radioiodine in irradiated lenses with initial cataractous changes was greater than its accumulation in normal lenses. It suggested an increased permeability by the damaged lens for radioiodine. Experiments with radioactive indicators do not seem to support the theory that increased permeability of the lens or depressed processes of phosphorylation result in the development of lenticular opacities produced by x rays, but they do suggest that these changes accompany, and perhaps influence, the progress of the opacification.

6583

EFFECTS OF X-RAYS PRODUCED AT TWO MEGAVOLTS ON SOME ASCOSPOROGENOUS YEASTS. Cecil G. Dunn. Am. Brewer (1951) May.

Five genera of ascosporogenous yeast showed different degrees of sensitivity to x rays (500 to 25000 r); 80% of

the cells of all genera were destroyed by 25000 r. Susceptibility rather than number of cells determines the per cent of survival.

6584

LETHAL IRRADIATION OF MICE WITH HIGH DOSES OF ROENTGEN AND GAMMA RAYS. P. Bonét-Maury and F. Patti. Radiology 57, 419-23(1951) Sept.

Comparison of data was made on mice irradiated over a wide dosage range, under identical conditions, with x and γ radiation. X- and γ-ray doses measured by a graphite-bakelite ionization chamber corresponded fairly well to the energy actually absorbed by the mice and are directly comparable. Though the irradiated animals showed identical symptons of poisoning, a greater amount of γ energy than of x-ray energy was required in the tissues for similar biological effects. This result was attributed to different primary radiochemical reactions resulting from unequal ion distribution along the electronic path of the two radiations.

6585

GROWTH OF BACTERIA IN THE PRESENCE OF RADIOACTIVE PHOSPHORUS. Francis E. Clark and C. A. I. Goring. J. Bact. 62, 352-4(1951) Sept. (Note)

A basal soil extract broth initially containing 0.2 ppm inorganic P and 0.6 ppm organic P was enriched with 0.5% glucose, 0.2% KNO_3, 0.1% $MgSO_4$, and 4 ppm P^{31} as KH_2PO_4. The added phosphorus contained either 0, 0.01, 0.1, 1.0, or 5.0 mc of P^{32} per mg P^{31}. Sterilized aliquots at each level of activity were given standard inocula of known microorganisms. The results suggest that although P^{32} exerts lethal effects on many individual cells, the surviving cells continue to multiply until their growth is limited by other factors, such as accumulation of staling products or substrate exhaustion. Consequently, turbidimetric or gravimetric differences, or interference with substrate transformation as indicated by measurements of pH or of C, N, or P mineralization may not be readily apparent. Nevertheless, in view of higher viable counts at 7 days for the 0.1-mc level of activity than for the 0 level, it is believed that low levels of P^{32} must to some extent delay normal aging or growth cycle of cultures. Low viable counts at 5.0 mc and the cytological observations at 0.1 mc or more of activity likewise indicated a deleterious effect of such levels of P^{32} radioactivity.

6586

THE ELECTROLYTIC RESISTANCE OF THE BLOOD CLOT IN POLYCYTHEMIA VERA BEFORE AND AFTER RADIATION AND ITS RELATIONSHIP TO CLOT RETRACTION. Henry H. Henstell, Irma S. Henstell, and Edward M. Ornitz, Jr. Am. J. Clin. Path. 21, 820-7(1951) Sept.

In polycythemia vera, an increase in the electrolytic resistance of the whole blood clot and in strength of clot retraction occurs. Platelet count shows no relationship to clot resistance or percentage of clot volume. Total-body x irradiation as well as P^{32} therapy decreased the strength of clot retraction in patients suffering from polycythemia, independently of the effect of radiation upon the red cell values.

6587

MECHANISMS OF BIOLOGICAL EFFECTS OF PENETRATING RADIATIONS. Cornelius A. Tobias. Federation Proc. 10, 595-601(1951) Sept.

Brief descriptions are given of the mechanism of interaction of radiation with matter, various biological effects of breakdown of macromolecules by direct action of ionizing radiation, and examples of recent experimental approaches to indirect action of radiation. The effects of radiations at the cellular level were studied in haploid and diploid yeast cells. The 5 times greater resistance of diploid cells against radiation injury is explained as due to the presence of paired genes and chromosomes in the diploid cells, controlling the cell mechanisms from a number of mutually independent pairs of sites, whereas the one set of chromosomes in haploid cells results in each site being represented only once. Radiation effects on mammals and new modes of therapy of radiation injuries are reviewed.

6588

LIVER CIRRHOSIS WITH ASCITES, INDUCED IN DOGS BY CHRONIC MASSIVE HEPATIC IRRADIATION WITH RADIOACTIVE COLLOIDAL GOLD. P. F. Hahn, Marvin A. Jackson, and Horace Goldie. Science 14, 303-305(1951) Sept.

A report is made of lesions in the liver of 7-week old dogs following the intravenous administration of from 59 to 102 mc of radioactive colloidal Au given in three doses over a period of approximately six weeks. Dosages were estimated at 67,000 and 65,000 equivalent β-roentgen to the liver. Approximately 6 weeks after the last injection of the colloid, increasing amounts of ascitic fluid accumulating in the abdominal cavity were noted. A marked retardation in growth and general appearance was also noted. Tracer quantities of radioactive Au colloid administered by vein showed a marked lag in the time of disappearance from the circulatory system, suggesting an impaired ability for phagocytosis by the reticuloendothelial system. Both dogs died from the severe damage induced by the radiation in the liver. At autopsy about 1,000 ml of clear, slightly yellow fluid was withdrawn from the peritoneal cavity of one dog and about 1,800 ml from another. The most obvious effects of irradiation in both dogs were disappearance of endothelium and marked increase in connective tissue surrounding the blood vessels of the liver. Pathological changes in the liver induced by the massive chronic irradiation resembled a combination of Chiaris syndrome (obliteration of the hepatic vein) and of central fibrosis. Considerable damage to both spleen and kidneys was also noted.

RADIATION HAZARDS AND PROTECTION

6589

Naval Radiological Defense Lab.

OPERATIONAL FEASIBILITY OF DECONTAMINATING MATERIALS EXPOSED TO ATOMIC WARFARE; I. BACKGROUND AND GENERAL PRINCIPLES; INTERIM REPORT (Technical Objective SR-2z); by Nathan E. Ballou. Aug. 15, 1950. 29p. (AD-236(Z))

The many factors to be considered in radioactivity decontamination are enumerated and analyzed. Among these are usefulness, necessity, and value vs. risk; damage and degree of contamination; dosage allowed; amount of decontamination required; time needed for decontamination; length of time elapsed after detonation; intensity of radiation; nature of surface; nature of contamination; rates of reaction; recontamination; advance preparation; drainage; and disposal of wastes. Decontamination methods include removal of loose contaminated material, treatment with chemical agents such as complexing compounds, highly charged ions, and detergents, and removal of surface layers by chemical or physical means. Anticontamination measures include the preparation of special surfaces which have low contaminability characteristics or which are easily decontaminated, and methods which cause physical interruption of the contamination process. (auth)

6590

Kellex Corp.

SUMMARY PROGRESS REPORT; AUGUST 1950; GAS DECONTAMINATION (24-A2) JOB 24-A; W. A. Bain. Sept. 8, 1950. 6p. (KLX-1314)

Application of several previously developed particle build-up techniques to a wet suspension of NaCl gave the same build-up as was obtained with the standard dry NaCl suspen-

sion. It was determined by the jet-impinger analyzer that both cyclone and impingement-scrubber types of particle separators remove the equivalent of all the standard NaCl suspension which has been built up to 5 μ or larger and practically all in the 2 to 5 μ range but fail to remove particles under 2 μ. This test also confirms the view that jet-impinger analysis can be used to predict the performance of certain types of separators.

6591

RADIOACTIVE WASTE DISPOSAL. J. F. Newell and C. W. Christenson. Sewage and Ind. Wastes 23, 861-8(1951) July.

A review appears in Ind. Hyg. Digest 15, No. 9, 31(1951) Sept. and is reproduced here in its entirety.

Methods of handling radioactive wastes include storage, evaporation, ion exchange, adsorption agents, chemical coagulation, biological methods, and combinations of these methods. Their relative merits are discussed. Ion exchange appears to be quite promising in removal of radioactivity from laboratory wastes. Coagulation is most feasible for removing single elements. In most cases storage and evaporation are expensive, and adsorption and biological methods have limited use.

6592

THE STUDY OF DUSTS IN INDUSTRIAL ATMOSPHERES. 6—PHOTOELECTRIC APPARATUS AND APPARATUS FOR THE COLLECTION OF LARGE SAMPLES. P. F. Holt. Metallurgia 44, 108-10(1951) Aug.

The desirability and difficulties of obtaining dust counts and mass concentration figures immediately and in any location are discussed briefly, and problems involved in photoelectric methods using absorption, Tyndall effects, or densitometry of filter paper deposits are mentioned. Several methods of collecting massive dust samples are sketched.

6593

STUDIES ON RADIOISOTOPE REMOVAL BY WATER TREATMENT PROCESSES. Rolf Eliassen, Warren J. Kaufman, John B. Nesbitt, and Morton I. Goldman. J. Am. Water Works Assoc. 43, 615-37(1951) Aug.

Various phases of the relationship of radioactive materials to sanitary engineering are presented. Radiation sources, removal of radioisotopes from contaminated water by means of evaporation, chemical coagulation or carrier precipitation, ion exchange resins and clays, and biological adsorptive or assimilation processes are discussed.

6594

THE USE OF LEAD SHOT FOR PROTECTION FROM GAMMA RADIATION. A. Nightingale. Brit. J. Radiology 24, 568-71(1951) Oct.

Cavity walls filled with small lead shot may safely be used instead of solid lead, at least at thicknesses above 1.4 in., for personnel protection against γ rays. They are not suitable for shielding fixed objects such as photographic material. The diameter of the lead shot should not be greater than the effective diameter of the source. (auth)

6595

EFFECT OF THYROID HORMONE ON RADIATION LETHALITY. Willie W. Smith and Falconer Smith. Am. J. Physiol. 165, 639-50(1951) June.

The effect of the thyroid hormone in increasing x-radiation lethality was evaluated, and the critical period of susceptibility to the thyroid effect delineated. Dinitrophenol was found to increase the proportion of deaths after irradiation. Thiouracil and propylthiouracil failed to protect against radiation lethality. A yeast supplement failed to prevent thyroid from increasing the mortality after irradiation. Weights of adrenal, lymphoid tissue, and kidney were determined and blood studies made in thyroid-treated and control irradiated mice. No evidence was found to indicate that the thyroid effect is secondary to its action on the adrenal. After sublethal radiation, leucocytes and hemoglobin were more depressed in thyroid-treated than in control mice.

6596

SECONDARY RADIATION FIELDS SURROUNDING PHOTOFLUOROGRAPHIC EQUIPMENT. Willard W. Van Allen. Radiology 56, 832-41(1951) June.

The field patterns of scattered radiation surrounding photofluorographic equipment now in use were investigated. The integrating ionization-chamber circuit used, consisting of a low-leakage condenser, ionization chamber, electrometer tube, and meter, is described. For measuring roentgen exposures of low intensities a special chamber was designed. Diagrams of the results of these field measurements are shown. Operating personnel of photofluorographic equipment seem to be quite safe, especially if they do not approach the edge of the screen.

6597

EFFECTS OF THYROID AND RADIATION ON SENSITIVITY TO HYPOXIA, BASAL RATE OF O_2 CONSUMPTION, AND TOLERANCE TO EXERCISE. Willie W. Smith and Falconer Smith. Am. J. Physiol. 165, 651-61(1951) June.

In thyroid-treated mice, increased basal O_2 consumption, increased sensitivity to progressive hypoxia, and decreased tolerance to exercise follow the same course of development in time. After irradiation no increase in basal O_2 consumption was found and sensitivity to progressive hypoxia was decreased. After 325 r there was no decrease in tolerance to exercise within the limits of the test. Thyroid administration superimposed upon radiation resulted in no increase in basal O_2 consumption beyond that caused by thyroid alone. Resistance to progressive hypoxia was greater than with thyroid alone. Exercise was tolerated almost as well as it was with thyroid alone. The large number of early failures and deaths of thyroid-treated mice during the exercise test indicates defective functional capacity of the heart rather than general fatigue.

6598

STUDIES ON THE PROBLEM OF PROTECTION AGAINST THE EFFECTS OF X RAYS. Arne Forssberg. J. chim. phys. 48, 262-3(1951) May-June.

Results of experiments on the protective properties of cysteine against radiation injury are reported. Irradiated bacteria grown in a medium to which cysteine was added showed from 25 to 45% better growth than controls. It was concluded that sulfhydryl substances in general act as protective agents even if they are not normal metabolites of the organism. In a study of the protective action of cysteine upon a part of the body through local injection preceding whole-body irradiation, the amount of epilation of guinea pigs was used as the criterion. When 5 mg neutralized cysteine was injected intracutaneously 10 min before irradiation (50 kv giving 700 to 900 r) the cysteine fields showed little damage after 10 days while control fields were naked. Results of a study of the effect of cysteine and x irradiation upon nucleic acid turnover using young mice given cysteine followed by total body x irradiation and a subcutaneous injection of C^{14}-labeled acetate are given. The C^{14} content of the nucleic acid fraction showed a strong accumulation of the isotope in combined cysteine and x-ray treated animals, in contrast to a decrease in untreated irradiated animals.

6599

EXERCISE EFFECTS ON TOLERANCE TO RADIATION. Falconer Smith and William W. Smith. Am. J. Physiol. 165, 662-6(1951) June.

As a whole, the effect of moderate exercise for 8 hr consecutively a day, or for 12 hr a day in equally spaced

periods of 3 hr, was to decrease slightly, if at all, the tolerance of mice to whole-body irradiation. After a radiation dose which was 100% lethal, 7 out of 30 mice failed to tolerate 3 consecutive days of exercise for 8 hr/day. Those surviving the exercise period showed no difference in survival time from their irradiated controls. Phenobarbital sedation after irradiation failed to increase the radiation tolerance of mice. It is concluded that radiation lethality does not parallel the rate of O_2 utilization under the conditions of these experiments.

6600
PROTECTION FROM WHOLE-BODY IRRADIATION BY CHEMICAL MEANS. R. H. Mole. J. chim. phys. 48, 258-61(1951) May-June.

The chemical protection afforded mice against radiation injury, following whole-body x irradiation, by injected doses of thiourea, sodium ethane-di-thiophosphate, glycerol, sodium thiosulfate, and sodium dithionate was studied. Of these, thiourea was the only chemical giving a definite protective effect (equivalent to a reduction in the effectiveness of radiation by about 10 or 15%) and this only when given immediately before irradiation.

6601
PERFORMANCE OF INDUSTRIAL AEROSOL FILTERS. Leslie Silverman. Chem. Eng. Progress 47, 462-8(1951) Sept.

A general nonmathematical discussion of types of filters, theory of operation, and basic characteristics is presented. Performance data on several filters are summarized, but no new experimental data are given. 16 references.

RADIATION SICKNESS

6602
HEMATOLOGY, DIAGNOSIS, AND THERAPY OF RADIATION INJURY. E. P. Cronkite. U. S. Armed Forces Med. J. 2, 1019-26(1951) July.

An abstract appears in Ind. Hyg. Digest 16, No. 9, 29 (1951) Sept. and is reproduced here in part.

The hematological effects of radiation are discussed on the basis of animal experiments, with conclusions on the value of hematologic observations on the prognosis of radiation illness. The next subject is the diagnosis of radiation injuries and the segregation of a population into improbable, possible, and probable survivors. The evaluation of symptoms is judged to be the best approach to the diagnosis. Therapy is then discussed on the basis of present knowledge.

RADIOGRAPHY

6603
THE ROENTGEN DEMONSTRATION OF THE DEPOSITION OF COLLOIDAL THORIUM DIOXIDE (THOROTRAST) IN THE GALLBLADDER WALL. Everett L. Pirkey, Richard C. Taylor, Aura J. Miller, Frank Denman, and Herbert D. Kerman. Am. J. Roentgenol. Radium Therapy 66, 208-14 (1951) Aug.

A brief review of the literature concerning the deposition and retention of intravenous colloidal thorium dioxide (thorotrast) is presented. A report is given of a case of roentgenographically demonstrated thorium dioxide deposited in the gall-bladder wall and proved with radioautographs.

RADIOTHERAPY

6604
Massachusetts General Hospital and Brookhaven National Lab.
THE USES OF NUCLEAR DISINTEGRATION IN THE DIAGNOSIS AND TREATMENT OF BRAIN TUMOR; by William H. Sweet. [nd] 17p. (AECU-1651)

A summary of the use of radioisotopes in localization and delineation of brain tumors is given. Difficulties encountered in using this technique are discussed. A description of the Robinson type G-M probe counter is given and 105 brain tumors localized with this counter following injection of P^{32} are reported. Work reported with isotopes and brain tumors indicates that P^{32} concentrates much more in brain tumors than in normal brain so that a probe type G-M counter detecting β radiation can be used to advantage to find and to delimit such tumors at operation. K^{42} also concentrates in these tumors and its γ ray permits external localization of many of these tumors through the intact skull. γ rays emitted when a positron and electron collide and are annihilated are likely to be particularly valuable in the external localization of tumors. B^{10} can be concentrated sufficiently in brain tumors to suggest that irradiation with slow neutrons may be useful in their therapy.

6605
DISTRIBUTION OF RADIO-IODINE IN HUMAN THYROID GLAND. Selwyn Taylor and Frank S. Stewart. Lancet 261, 232-5(1951) August 11.

A technique is described for measuring the distribution of radioiodine in the human thyroid gland. A G-M directional counter is used in conjunction with a perspex grid or jig which fits the patient. Results are recorded in the form of iodine charts which prove useful as an aid to diagnosis.

6606
RADIOTHERAPEUTIC PHYSICS. 1. THE PHYSICAL ASPECTS OF TREATMENT OF CANCER BY 22-MEV X RAYS. H. E. Johns, E. K. Darby, and R. O. Kornelsen. Brit. J. Radiology 24, 355-64(1951) July.

Techniques developed for dosage control of betatron radiation are described. Skin dose, collimation of the x-ray beam, copper compensating filters, calibration of the betatron, dosimetry with the betatron, integral dose, sloping fields, and energy absorption are discussed.

6607
THE TREATMENT OF MULTIPLE MYELOMATA WITH RADIOACTIVE PHOSPHORUS. E. Lindgren, I. Bergström, and G. Wihman. Acta Radiol. 36, 49-62(1951) July.

The treatment of four cases of myelomatosis with radioactive phosphorus resulted in rapid alleviation of pain in every case and in certain alterations in the bone marrow.

6608
STUDIES WITH RADIOIODINE. I. FUNCTION AND RATE OF I^{131} UPTAKE OF THYROID. Earl R. Miller, Morris E. Dailey, A. V. Holmes, George L. Alexander, and Glenn E. Sheline. Radiology 57, 37-47(1951) July.

Correlation of the rate of uptake of I^{131} in the thyroid with the clinical evaluation of thyroid function as determined by history, physical examination, and other laboratory procedures was made. Sufficient clinical data were collected on 282 patients with normal and disturbed thyroid function to permit adequate evaluation. From data on the I^{131} uptake in the thyroid during the first 7 hr after its administration it was concluded it is not possible to differentiate between euthyroid and hypothyroid individuals. Tests on patients with nodular goiters were found to be unpredictable.

6609
THE DISTRIBUTION OF I^{131} IN TISSUE OBTAINED AT NECROPSY OR AT SURGICAL OPERATION IN MAN. George S. Kurland and A. Stone Freedberg. J. Clin. Endocrinol. 11, 843-56(1951) Aug.

The distribution of I^{131} is reported in seven euthyroid patients given 300 to 850 μc of I^{131} 4 to 168 hr before orchidectomy or oophorectomy and in six cases given 1.7 to 39.1 mc 1 to 8 days before death. Data indicate that the major portion of the radiation was to the thyroid gland.

Other organs were shown to receive 1% or less of the radiation delivered to the thyroid. In order of decreasing I^{131} uptake per gram of tissue, these organs were lung, kidney, pituitary, liver, gonad, spleen, adrenal, and pancreas.

6610

EXPERIENCES IN THE TREATMENT OF DISEASES OF THE THYROID GLAND WITH RADIOACTIVE IODINE. U. V. Portmann, Robert A. Hays, E. Perry McCullagh, and Charles E. Richards. Am. J. Roentgenol. Radium Therapy 66, 179-83(1951) Aug.

A report of 281 patients having hyperthyroidism treated with I^{131} is given. Of 181 patients with diffuse toxic goiter 60% are reported in remission in about 4 months after a total dosage of I^{131} averaging approximately 12 mc. Of 78 patients having nodular toxic goiter 23% still have hyperthyroidism requiring additional treatment. The dosage for remission is found to be higher for nodular than for diffuse toxic goiter, and the time required for control is found to be longer.

6611

OBSERVATIONS AND RESULTS IN THE TREATMENT OF HYPERTHYROIDSM WITH RADIOACTIVE IODINE (I^{131}). Cyril MacBryde, Leo Gottlieb, William H. Daughaday, and Bernard J. Sweeney. Am. J. Roentgenol. Radium Therapy 66, 171-8(1951) Aug.

A report of 269 patients with hyperthyroidism treated with I^{131} is given. Of these, 165 have been followed for 6 months to 3 yr. A satisfactory remission is reported in 68%.

6612

EFFECTS OF BETA RADIATION ON THE GASTRIC MUCOSA OF DOGS. D. M. Douglas, W. R. Ghent, and S. Rowlands. J. chim. phys. 48, 249-51(1951) May-June.

A method of reducing the gastric acidity of dogs by direct irradiation of the walls of the stomach with β rays is described. Applicators consisted of inflatable balloons impregnated with radiophosphorus.

6613

LIMITATIONS AND INDICATIONS IN THE TREATMENT OF CANCER OF THE THYROID WITH RADIOACTIVE IODINE. Rulon W. Rawson, J. E. Rall, and Wendell Peacock. J. Clin. Endocrinol. 11, 1128-42(1951) Oct.

The limitations to the treatment of the thyroid with radioactive iodine are defined as follows: (a.) The relative to absolute lack of natural avidity for I^{131} of practically all cancers of the thyroid and the natural variability in function of those tumors which do concentrate radioiodine. (b.) The physician-induced impairment to natural or induced avidity for radioiodine of certain tumors, i.e., by the administration of iodine or iodine-containing drugs or by the administration of noncancericidal amounts of radiation, isotopic or x-ray. (c.) The damaging effects of the radiation from radioiodine on normal or vital tissues, i.e., the blood and blood-forming organs.

The indications for the treatment of cancer of the thyroid with radioactive iodine are defined as follows: (a.) That the tumor be not removable by a competent surgeon. (b.) That the tumor be capable of concentrating enough radioactive iodine to exert a cancericidal effect. Methods of inducing this function in such tumors are discussed. (c.) That the calculated total blood irradiation delivered by the proposed therapeutic dose of I^{131} be within the range of safety, i.e., less than 500 rep. (auth)

6614

RADIOACTIVE PHOSPHORUS. II. IN THE TREATMENT OF MYELOID LEUKEMIA. Henry D. Diamond and Lloyd F. Craver. Cancer 4, 999-1008(1951) Sept.

A study of 77 patients with myeloid leukemia treated with P^{32}, with P^{32} and roentgen-ray radiation, and with P^{32} and other chemotherapeutic agents, culminating a 10-yr experience, is reviewed. It is concluded that oral administration of P^{32} is effective as a palliative method of treatment of chronic myeloid leukemia, and, when used in conjunction with local roentgen-ray radiation, both the hematological phase of the disease and the bulky tumefaction of the spleen may be controlled effectively in the early stages.

6615

PATHOLOGICAL EFFECTS AND RADIOAUTOGRAPHIC LOCALIZATION OF I^{131} IN HUMANS. John T. Godwin, B. J. Duffy, Jr., Patrick J. Fitzgerald, J. B. Trunnell, and Rulon W. Rawson. Cancer 4, 936-51(1951) Sept.

Radioautographic localization and pathological findings in postmortem studies of nine patients who were given carrier-free I^{131} in varying doses and intervals prior to death are reported. Radioautographs were negative on all organs except the thyroid, neoplastic thyroid lesions, the corpora amylacea of the prostate in one case, and the submaxillary-gland ducts and spleen in another. The degree of I^{131} pickup and histological effects varied widely in lesions of similar histological pattern in which localization would be anticipated. No effects directly attributable to I^{131} were seen in tissues other than thyroid carcinoma, metastatic deposits, and marrow in one instance.

6616

ESTIMATION OF BIOLOGICAL DOSAGE FACTORS IN CLINICAL RADIOTHERAPY. L. Cohen. Brit. J. Cancer 5, 180-94(1951) June.

In a previous paper (Brit. J. Radiology 22, 160, 706 (1949)) the author proposed the formula $D = EaT^{n}L^{-q}$ for determination of optimum curability dosages in radiotherapy (D = physical dose in r, E = biological dose in rec, T = time in days, L = field size in dm, a = quality of radiation, n and q are independent parameters; the rec is defined as the biological effect of 1r of γ rays delivered through a 10-cm diam field in 1 day). In this paper an additional parameter, the variance of the dosage, was statistically analyzed for 250 cases of epidermoid cancer. The simplified formula $D = Ea(T/L)^{n}$ was found to be valid in analysis of intensity of skin reactions. The uncertainty factor in dosage estimated on this basis ranged from 1.21 to 1.35. Under optimal conditions of time and area, 95% of epidermoid cancer cases could be cured with a dose exceeding the median lethal dose (3000 rec) by 30%. It has also been demonstrated that the prognosis is a mathematical function of the therapeutic ratio which is defined as the ratio of skin tolerance to mean lethal dose. The reliability of these estimations are discussed.

TOXICOLOGY STUDIES

6617

TOXICITY OF TITANIUM. J. Am. Med. Assoc. 146, 1175 (1951) July 21.

An abstract appears in Ind. Hyg. Digest 15, No. 9, 20-1 (1951) Sept. and is reproduced here in part.

The term "titanosis" appears in the literature, and here and there cases have been reported in which pulmonary lesions have been attributed to Ti. Usually the onus may be traced to admixed materials such as silica. Various salts may be detrimental, not because of the presence of Ti, but on account of associated radicals. Thus, titanium tetrachloride and titanium potassium chloride may serve as examples of toxic agents in the action of which Ti itself is unfairly held responsible.

6618
THE BERYLLIUM : CITRATE SYSTEM. I. DIALYSIS STUDIES IN ALKALINE SOLUTION. Isaac Feldman, W. F. Neuman, Robert A. Danley, and Jean R. Havill. J. Am. Chem. Soc. 73, 4775-7(1951) Oct.

Dialysis-equilibrium studies of the beryllium : citrate system in bicarbonate buffer showed that the maximum molar ratio in which Be and citrate ions combine to form a stable, soluble complex at pH of 8.25, ionic strength of 0.1, and at about 10^{-3}M Be is two. The effect of pH and of the order in which citrate and bicarbonate are added to Be is discussed. (auth)

6619
ANEMIA IN ACUTE EXPERIMENTAL BERYLLIUM POISONING. H. E. Stokinger and C. A. Stroud. J. Lab. Clin. Med. 38, 173-82(1951) Aug.

Anemia was produced in dogs, rats, and rabbits inhaling Be salts. The anemia resembled the macrocytic type and differed according to species. A species specific response to treatment with Lextron, folic acid, and vitamin B_{12} was demonstrated. Recovery from the anemia occurred spontaneously, requiring from 3.5 to 4 months in dogs, despite the presence of considerable amounts of Be in the tissues.

6620
STUDIES ON THE MECHANISM OF ACUTE BERYLLIUM POISONING. Kenneth W. Cochran, Marcella M. Zerwic, and Kenneth P. Du Bois. J. Pharmacol. Exptl. Therap. 102, 165-78(1951) July.

A study of the effects of various doses of Be on the phosphatase activity of rat and guinea pig tissue was conducted. Alkaline phosphatase of rat serum was markedly inhibited by Be in vivo. The adenosine triphosphatase activity of tissue was inhibited by Be in vivo as was the phosphoglucomutase activity of liver and skeletal muscle both in vitro and in vivo. Analyses of the livers and kidneys of Be-poisoned rats revealed a decrease in phosphocreatine and adenosine triphosphate and a marked increase in inorganic P.

6621
THE EFFECT OF LANTHANUM ON GROWTH AND METABOLISM OF STREPTOCOCCUS FAECALIS R. Moses Wurm. J. Biol. Chem. 192, 707-14(1951) Oct.

Streptococcus faecalis R requires phosphates in the basal medium for growth but not its resting metabolism. Lanthanum inhibits growth by forming insoluble $LaPO_4$ which results in a phosphate deficiency in the basal medium. The resting metabolism, measured in a PO_4^{-3}-free medium, is also inhibited by lanthanum, owing to a direct action upon the cell. Lanthanum is taken up by cells in amounts proportional to the concentration of the cation and the number of cells in the suspending medium. The possible mechanism of inhibition of cell growth and metabolism is discussed.

6622
INVESTIGATIONS ON THE METABOLISM OF FLUORIDE. I. THE DETERMINATION OF FLUORIDE IN BLOOD. Frank A. Smith and Dwight E. Gardner. J. Dental Research 30, 182-8(1951) Apr.

The adaptation of standard methods of fluoride analysis to the determination of fluoride in blood is described. A statistical evaluation is made of the precision of the overall method. Values are given for the fluoride content of blood from several species of animals. The values for normal dogs and rabbits are comparable and, in most cases, are less than 10 μg of fluoride per 100 ml of blood. (auth)

TRACER APPLICATIONS

6623
Brookhaven National Lab.
THE COPPER METABOLISM OF DROSOPHILA; by D. F. Poulson and V. T. Bowen. [nd] 1p. (AECU-1646)

The report is reproduced here in its entirety.

Uptake, distribution, and excretion of copper by larvae of four species of Drosophila, D. ananassae, D. melanogaster, D. repleta, and D. virilis, have been followed by determining activities of whole and dissected larvae at intervals after the feeding of Cu^{64} on various media at a series of copper concentrations. Uptake by larvae is proportional to concentration between 0.25 μg Cu/g of food and 25.0 μg/g. Within this range the data indicate that from 10 to 20% of the copper is located in the middle midgut cells. At higher concentrations, 25.0 to 50-0 μg Cu/g of food, disproportionately larger quantities are present in these cells. The quantities of copper taken up from media in the presence or absence of yeasts are essentially the same. Copper, previously incorporated in yeasts, of the genera Candida, Debaryomyces, and Hansenula, is also readily taken up by larvae. When yeasts grown on Cu^{64} are suspended in saline containing varying concentrations of stable copper, the uptake by larvae of Cu^{64} from these yeasts is not influenced by the stable copper concentration. There are, thus, two independent paths of uptake, one for free copper, one for yeast copper. Excretion is slower than uptake and is performed chiefly by cells of the middle midgut. Autoradiographs show the greatest relative concentrations of Cu^{64} in the middle midgut cells, with decreasing concentrations in other regions of the midgut, and in the malpighian tubules. The data will be discussed in relation to histochemical and fluorescence studies which have been and will be reported elsewhere.

6624
Atomic Energy Project, Univ. of Rochester
THE SURFACE CHEMISTRY OF BONE; VI. RECRYSTALLIZATION IN VIVO; by W. F. Newman and B. J. Mulryan. Oct. 9, 1951. 13p. (UR-184)

Young rats were given radiophosphate intraperitoneally. At varying time intervals thereafter, femurs were removed, de-fatted, and ground. The powdered bone specimens were shaken with inert phosphate buffer. With increasing time after injection, less radiophosphate was desorbable. This was interpreted to mean a greater incorporation of radiophosphate within the mineral crystals of bone. These data support the hypothesis that the recrystallization of bone mineral occurs in vivo. (auth)

6625
RADIOACTIVE ISOTOPES IN MEDICINE. I. PHOSPHORUS. R. G. Wood. Atomics (London) 2, 217-29, 237(1951) Aug.

A survey of the medical application of P^{32} includes general discussions on isotopes of P, biochemical applications, uses of inorganic P, uses of organic P, physiological applications, diagnostic application, therapeutic applications, and dosage.

6626
A RAPID METHOD FOR CLINICAL TOTAL BLOOD VOLUME DETERMINATION USING RADIOACTIVE IODINATED HUMAN SERUM ALBUMIN (RIHSA). J. Bradley Aust, Shelley N. Chou, James F. Marvin, Edwin L. Brackney, and George E. Moore. Proc. Soc. Exptl. Biol. Med. 77, 514-18(1951) July.

A clinical laboratory procedure for directly measuring total circulating blood volume using RIHSA as the tracer agent is described. A report is included of 40 cases in whom total circulating blood volume was determined by this technic. Advantages of the method are discussed.

6627

INCORPORATION OF LABELED CYSTINE INTO TISSUE PROTEIN AND SUBCELLULAR STRUCTURES. Norman D. Lee, Jean T. Anderson, Ruth Miller, and Robert H. Williams. J. Biol. Chem. 192, 733-42(1951) Oct.

dl-Cystine, labeled with S^{35}, was used to study the metabolism of this amino acid in the rat. The specific activity of the sulfur in various organs and their proteins, and in the subcellular components of liver, was determined, as was the urinary excretion of S^{35}. The specific activity of the sulfur in all organs was greater, initially, than that of the respective proteins. S^{35} concentration in the organs decreased rapidly throughout the first 24 hr after cystine administration, whereas that of the proteins achieved a maximum value. This time interval coincided with that for the excretion of 50% of the S^{35} administered and with that at which identity of protein and organ values was approximated. At 8 hr after cystine administration, the protein specific activity of intestinal mucosa and kidney was greatest, that of plasma, spleen, adrenal liver intermediate, and heart least. The incorporation of S^{35} into the protein of the subcellular components of liver was greatest in the microsomal fraction and least in the mitochondrial fraction.

6628

STUDIES ON THE CARBOHYDRATE AND PROTEIN METABOLISM OF THE RAT HEPATOMA. Paul C. Zamecnik, Robert B. Loffield, Mary L. Stephenson, and Jean M. Steele. Cancer Research 11, 592-602(1951) Aug.

A study was made of factors involved in the increased aerobic glycolytic rate in tumors. Glucose labeled in all 6 carbons was synthesized for a study of the fate of glucose fragments in the various metabolic currents within the cell in normal and neoplastic hepatic tissue slices. These experiments failed to disclose any qualitative differences in metabolic pathways followed by neoplastic and normal hepatic tissues. Evidence implies that the synthetic activities of the hepatoma slice are adjusted more toward construction of molecules such as proteins which are immediately concerned with cell growth than toward storage of energy-rich material such as glycogen for future use.

6629

PHOTOSENSITIVE OR CONGENITAL PORPHYRIA WITH HEMOLYTIC ANEMIA. II. ISOTOPIC STUDIES OF PORPHYRIN AND HEMAGLOBIN METABOLISM. Moisés Grinstein, Robert Aldrich, Violet Hawkinson, Paul Lowry, and Cecil James Watson. Blood 8, 699-705(1951) Aug.

Porphyrin and hemoglobin metabolism were studied in a case of photosensitive or congenital porphyria with the aid of glycine containing N^{15}. A rapid incorporation of glycine N^{15} was observed in the hemoglobin protoporphyrin, in both coproporphyrin isomers of the urine and in the type I isomer in the feces; also in the uroporphyrin I of the urine, and in the protoporphyrin and stercobilin of the feces. The N^{15} data obtained for the urinary and fecal coproporphyrin and the urinary uroporphyrin show a synthesis similar in character to that of the hemoglobin protoporphyrin.

6630

METABOLISM OF ACETATE BY ISOLATED PERFUSED DOG GASTROCNEMIUS INVESTIGATED WITH C^{13}-CARBOXYL-LABELED ACETATE. Nathan Lifson, Akira Omachi, and H. Mead Cavert. Am. J. Physiol. 166, 121-30 (1951) July.

The metabolism of acetate in the isolated perfused dog gastrocnemius muscle was investigated with the aid of carboxyl-labeled C^{13} sodium acetate. Under the conditions employed, 24 to 48% of the respiratory CO_2 recovered from the stimulated muscle was calculated to be derived from the administered acetate, on the assumption that both carbons of the acetate molecule are oxidized at equal rates. In unstimulated muscles 15 to 32% of the CO_2 was derived from the oxidation of the acetate. The glycogen recovered from neither resting nor active muscle to which isotopic acetate was administered contained definitely significant concentrations of isotope, indicating that less than one carbon atom out of 100 in the glycogen was derived from the administered acetate.

6631

OBSERVATIONS ON METABOLISM OF C^{14}-DIETHYLSTILBESTROL. Donald J. Hanahan, E. G. Daskalakis, T. Edwards, Hyp J. Dauben, Jr., Richard W. Meikle. Arch. Biochem. Biophys. 33, 342-3(1951) Sept. (Letter to the editor)

Adult female rats with biliary fistulas were given subcutaneous injections of C^{14}-diethylstilbestrol. The bile was collected for 6 hr and analyzed for its C^{14} content. From 64 to 90% of the administered radioactivity was recovered in the bile, with preliminary findings indicating a conjugate of diethylstilbestrol as the main compound, and 100% vaginal estrus response was elicted in bile fistula with ovariectomized rats given doses of C^{14}-diethylstilbestrol as low as 4 μg. Results suggest that biliary secretion into the gut represents a main pathway of removal of excess estrogen. It was also concluded that diethylstilbestrol is not oxidized to CO_2 in the rat.

6632

MACROPHAGE MIGRATION IN EXPERIMENTAL ATHEROSCLEROSIS. John H. Simonton and John W. Gofman. Circulation 4, 557-62(1951) Oct.

With the object of testing the importance of macrophage transport of lipid in the production of atheromas, a radioisotope was employed in labeling reticuloendothelial cells. Rabbits were injected with this isotope, and lipemia induced by cholesterol feeding. Subsequently the animals were sacrificed and the distribution of the label determined. High concentrations of the label were found in Kupffer cells, in splenic and marrow macrophages, but no significant increase was demonstrated in aortic atheromas. This finding is interpreted as evidence against the macrophage theory of genesis of atherosclerosis. (auth)

6633

THE EFFECT OF THYROID-STIMULATING HORMONE IN ACUTE THYROIDITIS. Jacob Robbins, J. E. Rall, J. B. Trunnell, and Rulon W. Rawson. J. Clin. Endocrinol. 11, 1106-15(1951) Oct.

Nine patients with acute thyroiditis have been studied and their clinical and laboratory findings reviewed. Eight of these patients had a marked decrease in thyroid function as evidenced by an uptake of radioiodine by the thyroid of 2.3% of the dose or less at 48 hr. The serum protein-bound iodine (PBI) when measured was normal or slightly elevated. All patients were clinically euthyroid. Six patients were treated with thyroid-stimulating hormone (TSH) in doses of 25 to 150 mg intramuscularly over a 1- to 5-day period. TSH induced an increase in the uptake of radioiodine by the thyroid in all instances, but in only 2 patients did this reach normal levels. In 5, improvement in clinical signs and symptoms was also observed, but in 4 of these patients the disease had relapsed within a week after treatment. All patients ultimately recovered from their illness, regardless of treatment, but resolution of the thyroid enlargement was a slow process. This small series allows no conclusions as to effective means of hastening recovery. (auth)

6634

PRECURSORS OF NUCLEIC ACIDS. George Bosworth Brown. J. Cellular Comp. Physiol. 38, Suppl. 1, 121-41 (1951) July.

A tracer (C^{14} and N^{15}) study of the precursors of nucleic acids was undertaken to determine what compounds are in-

volved in the biosynthesis of nucleoproteins. A second objective was to investigate structural analogs of these compounds in a search for antimetabolites which could interfere preferentially with rapidly growing tissues. Attention has so far been focused on the first objective. Experimental data show that certain free purines are used for the biosynthesis of nucleic acids but that their derivatives, as occurring in pentose nucleic acid, are more extensively catabolized and are but poorly utilized for nucleic acid production. In contrast, the pyrimidines cytosine and uracil are not utilized for nucleic acid synthesis while ribose derivatives are so utilized.

6635

ANALYSIS OF TECHNIQUES FOR THE DETERMINATION OF THYROID FUNCTION WITH RADIOIODINE. Gordon L. Brownell. J. Clin. Endocrinol. 11, 1095-1105(1951) Oct.

Two criteria are postulated as essential for a radioiodine, I^{131}, diagnostic test. The test should be indicative of thyroid status, and the test should measure a fundamental parameter of the thyroid. In support of the second criterion, the metabolism of labeled iodide and the release of labeled hormone by the gland are analyzed on the basis of simple models, and techniques are discussed for the determination of fundamental constants for the experimental data. The metabolism of iodide by a myxedematous subject is presented as an example. (auth)

CHEMISTRY

6636

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

CHEMISTRY OF THE FISSION ELEMENTS GROUP AND COSMIC RAY GROUP, p.1-14 of PROGRESS REPORT; AUGUST 31, 1951. 14p. (NP-3391 (p.1-14))

In addition to the formation of a 2 : 1 peroxide : cerium complex in carbonate medium, both the photometric-titration technique and the logarithmic-plot method of analyzing spectrophotometric data have strongly indicated the formation of a 1 : 1 complex at low peroxide concentrations. In studies of the diffusion current of In in nitrate medium it was found that the previous reduction of In did not affect the height of the hydrogen-ion reduction wave. Similar results were obtained in perchlorate media. In flame-photometry studies it has been shown that any atomizing system using compressed laboratory air is greatly affected by the atmospheric humidity unless 100% utilization of sample is employed. It was found that Ag, Rb, Sr, Cs, and Cu were readily detectable and determinable by flame excitation, while As, Mo, Ta, Hf, Zr, Y, Se, Cd, Sn, and Te were too weak to be determined. The 324.7-mμ line of Cu and the 338-mμ line of Ag were observed to show an unusual dependence on the anion present.

A photograph is shown of a V^0 decay in which both charged decay products undergo interactions in a Pb plate. An apparatus has been designed to make a separation of the hard component of cosmic rays in the upper atmosphere into 2 groups: with and without a high probability of nuclear interaction in matter. The significant parts of the apparatus are shown diagramatically. An example of a $\pi^+ - \mu^+ + e^+$ decay event is shown; it was obtained in a high-pressure cloud chamber, containing 55 illuminated grams of He, operated in conjunction with the synchrotron.

6637

Pittsburgh Univ.

PROGRESS LETTER FROM APRIL 1, 1951, TO JUNE 30, 1951; by Robert Levine, Lloyd B. Barkley, Newton N. Goldberg, and Bruno M. Perfetti. Issued July 19, 1951. 7p. (NYO-940)

A product which is probably α-phenylbenzoyltrifluoroacetone was obtained (1) by dissolving trifluormethyl benzyl ketone in pyridine and acylating with benzoyl chloride, and (2) by treating the sodium salt of the ketone with benzoyl chloride. The Li derivative of quinaldine (2-methylquinoline) obtained by reaction with phenyllithium may be acylated with various esters. A table showing the ketones formed by each ester and the yield obtained is included.

6638

Rutgers Univ.

STATUS OF THE RESEARCH PROGRAM ON PROJECT NO. AT(30-1)-1018. [nd] 9p. (NYO-815)

Polymer samples have been prepared by heating portions of monosodium phosphate at temperatures from 700 to 1000°C, cooling quickly, and dissolving the powdered samples in water. Methods are discussed for studying hydrolysis and shape of polyphosphate molecules and effect of various cations on viscosity of a sodium polyphosphate solution.

6639

Iowa State Coll.

THE ACTION OF INVERTASE PREPARATIONS; by S. Aronoff. [nd] 3p. (AECU-1665)

A radiogram is shown of equal aliquots of sucrose after hydrolysis by invertase on paper for varying lengths of time. Equal aliquots of 1% invertase were placed atop the sucrose spots after they were dry. The chromatogram was run in butanol-butyric acid. There was a slight amount of an unidentified component running along the solvent front in the aliquots to which the invertase had been added, but this component was not a trisaccharide since a trisaccharide would lie below the sucrose or coincident with it. There was no evidence of this new component when the chromatogram was rerun in saturated phenol.

6640

Sloan-Kettering Inst. for Cancer Research

A POLAROGRAPHIC STUDY OF PYRIMIDINES; by Liebe F. Cavalieri and Bertram A. Lowy. [nd] 18p. (AECU-1653)

Of 28 pyrimidines investigated, 12 have been found to reduce at the dropping mercury electrode. The number of electrons taking part in the reduction has been calculated with the recognized restriction in mind that this procedure is applicable to reversible systems. It is suggested that the reducible group in these compounds involves the -C = C-C = N- system. On the basis of an observed kinetic current it appears that 6-aminopyrimidine may tautomerize. (auth)

6641

NEPA Div.

REPORT ON HAFNIUM CARBIDE; by M. A. Schwartz. Jan. 25, 1949. 14p. (NEPA-878)

6642
CHEMICAL INVESTIGATIONS OF PROTACTINIUM. II. PREPARATION OF 20 mg OF PURE Pa_2O_5 AND PROPERTIES OF PENTAVALENT PROTACTINIUM. G. Bouissières and M. Haïssinsky. Bull. soc. chim. France (5) 18, 557-60(1951) July-Aug. (In French)

The steps taken in removing Ti, Zr, Fe, and Ta in the purification of Pa are detailed. The reactions of Pa(V) with H_2SO_4, $(NH_4)_2SO_4$, K_2SO_4, HF, NH_4OH, NaOH, KOH, H_2O_2, $(NH_4)_2CO_3$, Na_2CO_3, Na_3PO_4, $NaHPO_3$, $NaIO_4$, Na phenylarsinate, Na oxalate, citric acid, and tartaric acid are reported briefly and compared with those of Pa(IV), Zr, Th, U, Nb, Ta, and Ac. The chemical properties of Pa differ so greatly from those of Ac, Th, U, and the transuranic elements that the actinide hypothesis is considered untenable.

6643
THE SHIFT IN ISOTOPIC ABUNDANCES IN AN EQUILIBRIUM SOLUTION OF HYDROCYANIC ACID IN GLACIAL ACETIC ACID. Erwin Willy Becker and Wolrad Vogell. Z. Physik 130, No. 2, 129-38(1951). (In German)

The change in the ratio of the C and N isotopes between gaseous HCN and its solution in glacial acetic acid has been measured. The purpose of the investigation was to determine whether the isotope effect depends on the lattice vibration of the solvent or on an influence of the internal vibrations of the dissolved molecule. Since the ratio of the C and N isotope displacements was found to vary appreciably from one (1.74 ± 0.3), it is concluded that the influence of internal vibrations is important. The equilibrium constants for C^{13} and N^{15} exchange were found to be 1.0019 ± 0.0006 and 1.0011 ± 0.0005, respectively. The enrichment of both isotopes takes place in the liquid phase.

6644
THE SOLUBILITY, ACTIVITY COEFFICIENTS, AND SOLUBILITY PRODUCT OF MANGANESE(II) IODATE. Anson Mack Hayes and Don S. Martin, Jr. J. Am. Chem. Soc. 73, 4853-5(1951) Oct.

The solubilities of manganese(II) iodate in water at temperatures from 3 to 90°, in aqueous solutions of sodium chloride at 3° and 25°, and in aqueous solutions of potassium iodate and manganese(II) perchlorate at 25° were determined. Mean ionic activity coefficients have been calculated from the solubilities. The solubility product at 25° was 4.79×10^{-7} and the standard heat of solution was 2280 cal/mole.

6645
UNSATURATED FATTY ACIDS. II. SYNTHESIS OF cis- AND trans-5-OCTENOIC ACIDS. David R. Howton and Robert H. Davis. J. Org. Chem. 16, 1405-13(1951) Sept. (See also NSA 3-2138 and 5-2443)

Two new octenoic acids have been synthesized and characterized. cis-5-Octenoic acid was obtained by catalytic semihydrogenation of 5-octynoic acid. trans-5-Octenoic acid was prepared by two methods: (1) a classical two-carbon elaboration of trans-3-hexenoic acid via the malonic ester synthesis and (2) a novel sodium-liquid-ammonia semireduction of the corresponding acetylenic acid. (auth)

6646
ON THE MECHANISM OF ENZYME ACTION. XLVI. THE EFFECT OF CERTAIN IONS ON CRYSTALLINE TRYPSIN AND REINVESTIGATION OF ITS ISOELECTRIC POINT. M. Bier and F. F. Nord. Arch. Biochem. Biophys. 33, 320-32(1951) Sept.

Calcium and manganese ions are effective protectors of crystalline trypsin in alkaline solutions. Other ions seem to have no significant influence. The effect of calcium is due to a decrease in the rate of autodigestion of trypsin but does not affect the rate of tryptic digestion of other proteins. The isoelectric point of trypsin is in the neighborhood of pH 11, as determined by electrophoresis analyses. This high isoelectric point is correlated with the amino acid composition of trypsin and its amide nitrogen content. (auth)

6647
HALOGENIDES OF DI- AND TRIVALENT THORIUM. E. Hayek, Th. Rehner, and A. Frank. Monatsh. 82, No. 4. 575-87(1951) Aug. 15. (In German)

The preparation of ThI_3, ThI_2, $ThBr_3$, $ThBr_2$, $ThCl_3$, and $ThCl_2$ is described. Total synthesis from the elements was the best method found. The side reaction of ThI_4 with the SiO_2 of glass to $ThOI_2$, Si, and $ThSi_2$ is explained, and the behavior of Th metal of various O content is considered. The consequences of the properties of trivalent Th compounds to the arrangement of the periodic table, especially the position of the actinides, is discussed; Th is not considered to be the first member of the actinide series.

6648
PREPARATION OF ACETYLIDES OF LITHIUM AND BARIUM AND TRANSFORMATION INTO CARBIDES. PREPARATION OF BARIUM CARBIDE. Émile Masdupuy and Fernand Gallais. Compt. rend. 232, 1837-9(1951) May 16. (In French)

The action of C_2H_2 on Li dissolved in liquid NH_3 produces an ammoniacal acetylide, in confirmation of Moissan's results (Bull. soc. chim. France (3) 21, 911(1899)). An analogous reaction is obtained with Ba. The spontaneous decomposition of the acetylides leads partially to Li_2C_2 and BaC_2. Only the $(H_2C)_2Ba$, in vacuum at 120°C, produces relatively pure (97%) BaC_2.

6649
KINETICS OF THE ACID DENATURATION OF EGG ALBUMIN. Robert J. Gibbs, M. Bier, and F. F. Nord. Arch. Biochem. Biophys. 33, 345-6(1951) Sept. (Letter to the editor)

To study the influence of acid strength on the rate of denaturation of protein, the amount of egg albumin denatured in a given time was determined directly from the precipitate produced when an acidic solution was brought to the isoelectric point. Under the experimental conditions reported it was concluded there is a direct influence of hydrogen-ion activity on the rate of acid denaturation, and the denaturation of egg albumin is favored by the suppression of one critical stage of dissociation.

6650
ON THE MECHANISM OF INDIRECT ACTION. F. H. Krenz. J. chim. phys. 48, 237-41(1951) May-June.

The description advanced by physical chemists on the mechanism of indirect action considers the atoms and radicals to be formed initially in the tracks of charged particles moving through the solution with a wide range of energies. The linear density of the atoms and radicals is a function of the speed of the particles, increasing as the particles are slowed down. A treatment of the mechanism by nonhomogeneous kinetics is given based on Jaffe's theory of columnar ionization.

ANALYTICAL PROCEDURES

6651
Princeton Univ.
FUNDAMENTAL ANALYTICAL CHEMISTRY; PROGRESS REPORT; MAY 1, 1951 - JUNE 30, 1951; by N. H. Furman. [nd] 9p. (NYO-791)

Electrolytic and polarographic investigations showed that the addition of Cu, Ni, or Zn allowed Cd to be recovered substantially completely from sulfuric acid and sodium sulfate solution or from acidified vanadium solutions. Low recoveries of Cd and other metals were obtained when V was present in high concentrations during electrolysis. Conductomet-

ric and potentiometric methods for following the precipitation of copper cupferrate are described. Graphs are included which show per cent of cupferron extracted to ether as a function of pH and absorbance of cupferron in aqueous medium as a function of pH.

6652

Pittsburgh Univ.

STRUCTURE AND BEHAVIOR OF ORGANIC ANALYTICAL REAGENTS; II. STABILITY OF CHELATES OF o-AMINOPHENOL AND OF o-AMINOBENZENETHIOL; by Robert G. Charles and Henry Freiser. Issued Aug. 15, 1951. 10p. (NYO-737)

The acid dissociation constants of o-aminophenol and o-aminobenzenethiol and the stability constants of the chelates of these reagents with some common divalent metals have been determined by potentiometric titration techniques. The chelates of o-aminophenol are less stable than those of o-aminobenzenethiol, despite the greater acidity of the latter reagent. This is attributed to the probably greater covalent character of the metal-sulfur bond than that of metal-oxygen bond. While the order of stability of metal chelates in o-aminophenol is essentially the same as that observed in β-diketones and salicylaldehydes, there are significant differences in the order observed in the o-aminobenzenethiol complexes. The reactions of the o-aminophenol and o-aminobenzenethiol with numerous metals have been observed and tabulated. (auth)

6653

Massachusetts Inst. of Tech.

ANALYTICAL PROCEDURES FOR ETHYL XANTHATE LABELED WITH RADIOSULFUR; by A. M. Gaudin and John S. Carr. July 31, 1951. 14p. (NYO-875)

Ethyl xanthate labeled with S^{35} can be determined quantitatively in aqueous solutions by oxidation of xanthate S to sulfate ion with $KMnO_4$, precipitation of this sulfate as $BaSO_4$, and counting the activity of the precipitate. Xanthate adsorbed on mineral surfaces can be removed by leaching with pyridine, in which case, after the addition of $KMnO_4$, the pyridine must be neutralized and the solution made acid with concentrated HCl.

6654

Pittsburgh Univ.

STRUCTURE AND BEHAVIOR OF ORGANIC ANALYTICAL REAGENTS; I. THE CALVIN-BJERRUM METHOD FOR DETERMINATION OF CHELATE STABILITY; by Henry Freiser, Robert G. Charles, and W. Dwight Johnston. July 31, 1951. 10p. (NYO-736)

The Calvin-Bjerrum technique for evaluation of chelate stability has been adapted to the study of chelating agents possessing more than one acidic or basic group. The general applicability of the method is reviewed. In this connection, hydrolysis of some metal ions was studied as a possible source of error in the method. (auth)

6655

CHEMICAL ANALYSIS BY NEUTRON SPECTROSCOPY. T. I. Taylor, Robert H. Anderson, and W. W. Havens, Jr. Science 114, 341-55(1951) Oct. 5.

Applications of neutrons to problems of chemical analysis are reviewed. Basic information on neutron sources, neutron spectrometers, the nature of interactions, and variations in cross sections with neutron energy is presented. The following methods of analysis are discussed and examples are given: analysis by (1) resonance absorption and scattering of neutrons, (2) simple transmission measurements, (3) absorption of thermal neutrons, and (4) neutron activation. 29 references.

6656

THE ACIDIMETRIC DETERMINATION OF BERYLLIUM. V. K. Zolotukhin. Zhur. Anal. Khim. 6, No. 4, 246-50(1951). (In Russian)

The reaction $Be(OH)_2 + 4KF = K_2[BeF_4] + 2KOH$ may be used to determine Be by back-titration with phenolphthalein indicator. Direct titrations of solutions of Be salts give values about 5.5% too low in cold and about 3% too low in boiling solution. The principal impurities found in $Be(OH)_2$ formed either by precipitation from NaOH (or KOH) or by the reaction $BeSO_4 + KIO_3 + KI = Be(OH)_2 + K_2SO_4 + I_2$ are Be salts. Direct titration of $BeSO_4$ in boiling neutral solution by $Ba(OH)_2$ solution with phenolphthalein indicator gives good results. Acidimetry (with KF complexing) of the $Ba(OH)_2$ precipitated from the sulfate with $Ba(OH)_2$ gives satisfactory results.

6657

DETERMINATION OF TOTAL CARBON AND ITS RADIOACTIVITY. Donald D. Van Slyke, Robert Steele, and John Plazin. J. Biol. Chem. 192, 769-805(1951) Oct.

Methods for the determination of total carbon and carbon radioactivity in a single sample are described. Total carbon is determined by the wet combustion method of Van Slyke and Folch, with manometric measurement of the CO_2, air-free reagents being used in the manometric chamber so that the zero manometric reading can be determined after ejecting the CO_2. The ejected CO_2 is used for measurement of C^{14} activity. The sample size can be 0.1 to 15 mg of carbon. For the activity measurement, two methods were used: In Method I, the CO_2 was precipitated as $BaCO_3$, the $BaCO_3$ was filtered on a sintered glass disk, and the activity counted in a windowless methane-flow proportional counter. In Method II, the CO_2 was transferred to the gas-phase proportional counter developed by Bernstein and Ballentine, provision being made during the transfer for the exclusion of air and water vapor from the counter tube. By Method II the disintegrations of the total sample were measured directly, so that specific activities were obtained in terms of microcuries per gram of carbon. The $BaCO_3$ counter used in Method I is standardized by comparison with the gas-phase counter of Method II, so that specific activities obtained by Method I also can be expressed in absolute units.

6658

THE DETERMINATION OF TITANIUM IN RUTILE AND IN ILMENITE. José Jorge Nogueira, Jr. Rev. brasil. quím. (São Paulo) 31, 297-300(1951) June (In Portuguese)

A new method for the determination of Ti in rutile and ilmenite is described. The procedure is based on the idea that the solubility of titanic acid in a slight excess of potassium hydroxide increases with the addition of hydrogen peroxide, while hydrogen peroxide has no influence on ferric hydroxide precipitated by potassium hydroxide. Sodium hyposulfite can then be used to precipitate the metatitanic acid.

6659

NUCLEI FROM NORMAL AND LEUKEMIC MOUSE SPLEEN. II. THE NUCLEIC ACID CONTENT OF NORMAL AND LEUKEMIC NUCLEI. Mary L. Petermann and Rose M. Schneider. Cancer Research 11, 485-9(1951) July.

Nucleic acid content of nuclei from the spleen of mice having transplanted leukemia was found to be similar to that reported for rapidly growing tissues, while nuclei from the spleen of mice having spontaneous leukemia more closely resembled normal nuclei. It was concluded the changes in pentose nucleic acid, desoxyribose nucleic acid, and nitrogen per nucleus were characteristic of rapid growth rather than of any primary neoplastic process.

6660
FLUORIMETRIC MICRODETERMINATION OF URANIUM. II. EXTRACTION OF URANIUM. Masaki Nakanishi. Bull. Chem. Soc. Japan 23, 198-201(1950) Nov.

A minute amount of U, suitable for fluorimetric determination, is effectively precipitated from aqueous solutions with hydrous ferric oxide as co-precipitator. The efficiency of co-precipitation seems to be nearly perfect for the purpose.

6661
FLUORIMETRIC MICRODETERMINATION OF URANIUM. III. ISOLATION OF URANIUM AND PREPARATION OF THE FLUORESCENT MATERIAL. Masaki Nakanishi. Bull. Chem. Soc. Japan 23, 201-4(1950) Nov.

After U has been co-precipitated with iron hydroxide it can be separated from the Fe by dissolving the precipitate in HCl and keeping the solution at ~60°C while adding NH_3 and ammonium carbonate. The ammonium salts are removed from the filtrate which contains the U by decomposition with HNO_3. The U obtained is mixed with NaF and fluorescent beads are made from the mixture.

6662
DETERMINATION OF BERYLLIUM BY PHOTODISINTEGRATION. A. M. Gaudin and James H. Pannell. Anal. Chem. 23, 1261-5(1951) Sept.

Since analysis of Be in low grade beryl ores and ore treatment products was found to be difficult by ordinary chemical and spectrographic methods, exploitation of the (γ,n) reaction on Be^9 was investigated. Samples were irradiated with an Sb^{124} source and the neutrons liberated were moderated and counted in boron trifluoride-filled detectors. The method is sensitive, rapid, simple, and nondestructive. Interference by elements with high absorption cross sections and particularly by boron is discussed.

6663
DETERMINATION OF ZIRCONIUM-HAFNIUM RATIOS WITH p-BROMOMANDELIC ACID. Richard B. Hahn. Anal. Chem. 23, 1259-61(1951) Sept.

p-Bromomandelic acid can be used to determine the hafnium content in mixtures of pure zirconium and hafnium compounds. Under properly controlled conditions a precipitate of the tetra-p-bromomandelates corresponding to the theoretical composition, $Zr(C_8H_6O_3Br)_4$ and $Hf(C_8H_6O_3Br)_4$, can be obtained. The precipitate is dried at 120 to 130° C., weighed, ignited to the oxide, and weighed again. From these data the hafnium content of the mixture can be computed. Data are presented showing an accuracy of about ±0.5% (absolute) for samples containing more than 10% hafnia, which compares favorably with results obtained by the selenite method. In samples containing less hafnia, however, the selenite method gives more reliable results. A determination can be made in 5 to 6 hr by the p-bromomandelic acid method as compared with 25 to 30 hr by the selenite method. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6664
Carbide and Carbon Chemicals Co., K-25
UPPER LEVEL PRECESSION PHOTOGRAPHY AND THE LORENTZ-POLARIZATION CORRECTION; by Robinson D. Burbank. Issued Oct. 12, 1951. 19p. (K-834)

The precession camera can be used to record the entire reciprocal lattice out to 1 rlu (reciprocal lattice unit) using one crystal orientation. The general technique for recording the entire reciprocal lattice is illustrated by an example. For the data so recorded to be useful it is necessary to have the Lorentz-polarization correction (L.p) in some convenient form. The correction is presented as a series of seven contour diagrams showing $1/L.p$ as a function of ξ and ζ at constant values of τ, the quantities ξ, ζ, and τ being the cylindrical coordinates of a reciprocal lattice point.

6665
Ames Lab.
COMPOUNDS OF THORIUM WITH TRANSITION METALS; I. THE THORIUM-MANGANESE SYSTEM; by John V. Florio, R. E. Rundle, and A. I. Snow. Aug. 24, 1951. Decl. Oct. 16, 1951. 35p. (AECD-3249)

An investigation of the Th-Mn system indicated the presence of three compounds of roughly 67, 80, and 92 at. % Mn. The formulas $ThMn_2$, Th_6Mn_{23}, and $ThMn_{12}$ were assigned to these compounds. Structure factors and interatomic distances are tabulated for each compound. $ThMn_2$ has a C^{14}-type structure (isomorphous with $MgZn_2$), Th_6Mn_{23} is face-centered cubic, and $ThMn_{12}$ is body-centered tetragonal.

6666
THE CRYSTAL STRUCTURE OF POTASSIUM, AMMONIUM, AND CESIUM HEXAFLUOPHOSPHATES. Hans Bode and Heinrich Clausen. Z. anorg. u. allgem. Chem. 265, 229-43 (1951) July. (In German)

A new preparation method for NH_4PF_6 is described; high yields are obtained by the action of gaseous or liquid HF on phosphonitrile chloride $(NPCl_2)$. KPF_6 has a primitive cubic structure with a = 7.71 A; the unit cell contains four molecules. The K atoms and the center of gravity of the PF_6 group form a NaCl-type lattice. The F atoms are arranged octahedrally about the P atom in the general point group. At room temperature the groups in this α modification vibrate about the lattice diagonal; at about −40 to −50°C the vibration is frozen out. This form is probably unstable and transforms at −25 to −30°C to a β modification with a CsCl-type structure. Powder-diffraction data for the analogous NH_4PF_6 and $CsPF_6$ are given.

6667
CRYSTAL GROWTH. H. E. Buckley. New York, John Wiley and Sons, Inc., (1951). 571p.

This comprehensive treatment of the theory and practice of crystal growths contains 12 chapters with the following titles: solution and solubility, solubility and supersolubility; the artificial preparation of crystals; the Curie theory of crystal growth; the so-called velocities of growth; the diffusion theories; recent theories of crystal growth; ideal and real crystals; miscellaneous types of crystallization; dissolution phenomena; crystal habit modification by impurities; relationship of substances during crystallization peculiarities of crystal growth. Each chapter is followed by a bibliography. A more complete review of the book may be found in Am. Mineral. 36, 789-9(1951) Sept. - Oct.

DEUTERIUM AND DEUTERIUM COMPOUNDS

6668
Brookhaven National Lab.
THE MASS SPECTRA OF SOME DEUTERATED ISOPROPANOLS; by Lewis Friedman and John Turkevich. [nd] 9p. (AECU-1642)

The mass spectra of $(CH_3)_2CHOH$, $(CH_3)_2CHOD$, $(CH_3)_2CDOH$, and $(CH_3)_2CDOD$ are reported, and the mechanism of the formation of the more abundant fragment ions is discussed. The results support the concept of localized charge on the oxygen atom in the more abundant ions. (auth)

6669
SYNTHESIS AND MASS SPECTRA OF SOME HEXA-, HEPTA- AND OCTADEUTERATED DERIVATIVES OF PROPANE. Francis E. Condon. J. Am. Chem. Soc. 73, 4675-8(1951) Oct.

As part of a study of spectra and molecular structure, aimed at augmenting the usefulness of spectrometric methods of analysis, propane-1,1,1,3,3,3-d_6 and propane-d_8

were synthesized. The mass spectra of these compounds, and of acetone-d_6, propane-1,1,1,3,3,3-d_6-2-ol, propane-d_7-2-ol, 2-chloropropane-1,1,1,3,3,3-d_6 and 2-chloropropane-d_7, intermediates in the syntheses, are presented in comparison with the mass spectra of propane, acetone, 2-propanol and 2-chloropropane. (auth)

FLUORINE AND FLUORINE COMPOUNDS

6670

Columbia Univ.

NOMENCLATURE OF FLUOROCARBONS; by H. M. Haendler. Feb. 15, 1943. Decl. Oct. 9, 1951. 4p. (AECD-3255; A-552; IDR-39)

The following principles are suggested: (1) The term "perfluoro" is to be used as a prefix to indicate complete fluorination. (2) The name of the fluorocarbon is to be based on the parent substance of the product formed, rather than on the starting material. (3) Substitution is to be considered as in general organic nomenclature. (4) Parentheses are to be used in cases of possible ambiguity. (5) If there is a choice of two alternate names, the simpler one is advisable in certain cases. In general, the fluoro group would be considered a higher chief function than chloro, unless simplification is obvious. (6) In the aromatic series the hydrocarbon roots are to have the ending "ane" when fluorinated completely. (7) The prefix ϕ should be restricted to familiar usage and not employed in formal terminology of the fluorocarbons.

6671

Atomic Energy Research Establishment, Harwell, Berks. (England)

THE INFRARED TRANSMISSION OF SOME HF RESISTANT MATERIALS; by J. Gaunt. Aug. 30, 1951. 4p. (AERE-C/M-120)

Although etched by HF, rocksalt (transmission band 2 to 15 μ) and KBr (15 to 25 μ) have been found suitable for study of the infrared spectrum of UF_6 if the absorption cells are evacuated below 10^{-5} mm Hg for several days to remove moisture; a small desiccator to protect the outer face of the window is sketched. Transmission curves are shown for silica-free phosphate glass (transmits only to 2.7 μ), synthetic sapphire (excellent transmission from 2000 A to 5.5 μ and not attacked by HF), synthetic spinel (resistance to HF not known), Teflon, and fluorothene (the material of choice in studying the fundamental vibration of HF, although having two weak absorption bands at 2.9 and 3.3 μ).

6672

FLUORINATION OF PENTANES BY COBALT TRIFLUORIDE. E. J. Barber, L. L. Burger and G. H. Cady. J. Am. Chem. Soc. 73, 4241-3(1951) Sept.

Perfluoro-n-pentane, perfluoroisopentane and perfluorocyclopentane have been prepared by the action of hot cobalt trifluoride upon vapors of the parent hydrocarbons. The crude products were separated into their components by careful fractional distillation. Fluorination of neopentane produced numerous substances including perfluoroisopentane. No perfluoroneopentane was found among the products. Each of the crude products of fluorination contained incompletely fluorinated substances and a small proportion of unsaturated fluorocarbon. A complex mechanism which explains the known facts about the reaction of a hydrocarbon with hot cobalt trifluoride has been proposed. (auth)

6673

THE LIQUID–VAPOR EQUILIBRIUM OF THE SYSTEM TUNGSTEN HEXAFLUORIDE-PERFLUORO-n-PENTANE. E. J. Barber and G. H. Cady. J. Am. Chem. Soc. 73, 4247-50(1951) Sept.

The system tungsten hexafluoride–perfluoro-n-pentane has been studied under conditions of a constant temperature of 25° and also under conditions of a constant pressure of 1.5 atm. A positive deviation from Raoult's law was found, the system forming a minimum boiling mixture containing about 93 mole % tungsten hexafluoride. The maximum observed excess free energy of mixing was about 60 cal/mole, obtained at 0.6 mole fraction tungsten hexafluoride. The solutions were not strictly "regular," and they were more nearly ideal than one would predict from the solubility theory developed by Hildebrand and Wood (J. Chem. Phys., 1, 817 (1933)) and by Scatchard (Chem. Revs., 8, 321 (1931)). Consideration of the effect of the difference between molecular volumes of the components upon the entropy of mixing improved the agreement between the theoretical and experimental values but did not completely remove the discrepancy. (auth)

6674

THE LIQUID–VAPOR EQUILIBRIUM OF THE SYSTEM TUNGSTEN HEXAFLUORIDE-PERFLUOROCYCLOPENTANE. Gilson H. Rohrback and George H. Cady. J. Am. Chem. Soc. 73, 4250-1(1951) Sept.

The liquid–vapor equilibrium of the system tungsten hexafluoride–perfluorocyclopentane has been studied at 25° and at 45°. This system, like that described in the preceding paper [preceding abstract] is more nearly ideal than one would predict from the solubility theory. The deviation from that theory can be largely attributed to a greater than ideal entropy of mixing caused by the difference in size of molecules of the two components. (auth)

6675

PHYSICAL PROPERTIES OF PERFLUOROPENTANES. Leland L. Burger and George H. Cady. J. Am. Chem. Soc. 73, 4243-6(1951) Sept.

Melting points, transition temperatures, densities and viscosities of carefully purified perfluoro-n-pentane, perfluoroisopentane and perfluorocyclopentane, have been determined. In many ways perfluoro-n-pentane is very much like its isomer perfluoroisopentane. Their properties differ somewhat, however, in directions opposite to those found for the corresponding hydrocarbons. The theoretical significance of the results is discussed. (auth)

6676

PHYSICO-CHEMICAL PROPERTIES OF THE INTERHALOGEN COMPOUNDS. N. N. Greenwood. Revs. Pure Applied Chem. 1, 84-120(1951) June.

In this review the published data on eleven interhalogen compounds are considered and the best available data are tabulated. The eleven compounds, which are discussed separately, are ClF, BrCl, BrF, ICl, IBr, ClF_3, BrF_3, ICl_3, BrF_5, IF_5, and IF_7. Their physical, thermodynamic, and electrochemical properties are described and tables of the degrees of dissociation, heats of formation, standard absolute entropies, Trouton constants, and conductivities are included. The interhalogens as ionizing solvents and the relation between color, conductivity, and reactivity of solutions of interhalogens are discussed. 184 references.

GRAPHITE

6677

CARBON AND GRAPHITE. W. M. Gaylord. Ind. Eng. Chem. 43, 2199-2202(1951) Oct.

Important developments in the use of C, graphite, and impervious C and graphite in the chemical industry since 1949 are summarized. A bibliography is presented covering mechanical properties of graphite, corrosion resistance to various solutions, and process-equipment development. 53 references.

LABORATORIES AND EQUIPMENT

6678

Technical Information Service, AEC

DESIGN AND CONSTRUCTION OF RADIOCHEMICAL LABORATORIES; A SELECTED LIST OF UNCLASSIFIED REFERENCES. Oct. 1, 1951. (TID-3013)

This selective bibliography consists of 83 references to reports and journal articles on the design and construction of radiochemical laboratories. References are listed under the following headings: general building and construction, specific laboratories, surfaces and finishes, hoods, shielding, ventilation, and waste disposal.

RADIATION CHEMISTRY

6679

Tennessee Univ.

RADIOCOLLOIDS; by George K. Schweitzer and Morrison Jackson. [nd] 28p. (ORO-48)

This review includes discussions of detection methods available for the investigation of radiocolloids, theory of their formation and nature, and their applications and implications. Experimental results obtained by various investigators concerning the radiocolloidal behavior of the following elements are reported: Po, Bi, Pb, Th, Y, Zr, Nb, La, Np, Pu, Pa, Mg, Sc, Sn, Ti, Ce, Be, and Ba. Formation of radioaerocolloids of Rn is discussed briefly. 82 references.

6680

IONIZATION OF LIQUIDS BY RADIATION. Lauriston S. Taylor. J. chim. phys. 48, 168-71(1951) Mar.-Apr.

A review of research studies of ionization produced in liquids by radiation is presented. In general the National Bureau of Standards has sought to measure directly or indirectly all the ion pairs produced in a known small volume of liquid having, without the presence of radiation, a very high resistivity. Problems in measurement and their application to the measurement of radiation in tissue or tissue-equivalent material are discussed.

6681

THE USE OF ION EXCHANGERS FOR THE DETERMINATION OF PHYSICAL-CHEMICAL PROPERTIES OF SUBSTANCES, PARTICULARLY RADIOTRACERS, IN SOLUTION; IV. ACTIVITY COEFFICIENTS OF BARIUM NITRATE IN URANYL NITRATE. Jack Schubert. J. Am. Chem. Soc. 73, 4488-9(1951) Sept. (Note)

Measurements have been made on the activity coefficient of carrier-free doubly ionized Ba^{140} in uranyl nitrate solutions by the use of the uranyl form of the cation exchange resin, Amberlite IR-1. The equilibrium reaction between tracer Ba and cation exchanger is $Ba^{++} + UO_2R_2 \rightleftharpoons BaR_2 + UO_2^{++}$ in which R is the insoluble anionic part of the exchanger. The experimental and derived data are tabulated. The value of the thermodynamic exchange constant $K_a = 14$ was obtained from a plot of the experimentally determined values K_{ex} against some function of electrolyte concentration and extrapolating to infinite dilution.

6682

NUCLEAR CONTRIBUTION TO THE RETENTION FOLLOWING RADIATIVE THERMAL NEUTRON CAPTURE. A. G. Maddock and J. Green. J. chim. phys. 48, 207(1951) Mar.-Apr.

Data are presented showing that in radiative thermal-neutron capture the retention may arise from either the chemical inefficiency arising from that fraction of the recoiling atoms re-forming molecules of the parent species by one or two or more competitive reactions or the nuclear inefficiency arising from radiative capture without bond rupture.

6683

A STUDY OF THE ACTION OF NEUTRONS ON ORGANIC HALIDES. C. H. Collie and P. F. D. Shaw. J. Chim. phys. 48, 198-20(1951) Mar. - Apr.

Some of the factors affecting the efficiency of extraction of radiohalogens from neutron-irradiated organic halides are considered. In particular the role played by free radicals and unsaturated molecules produced by the recoiling halogen atoms is discussed.

6684

THE PRESUMED DISTRIBUTION OF IONS AND EXCITED GROUPS IN LIQUIDS. L. H. Gray. J. chim. phys. 48, 172-8(1951) Mar.-Apr.

The primary processes taking place when liquids, particularly water, are exposed to ionizing radiations are reviewed. A report is made of observations on the fate of energy of excitation of air exposed to electrons from a 2-Mev electrostatic generator at a rate of 10^6 r/sec. The light emitted appeared as a line spectrum distributed throughout the ultraviolet and visible spectrum. When water was exposed to the same beam the discrete spectrum disappeared and Cherenkov radiation appeared. Below 260 kv the Cherenkov spectrum vanished in water in accordance with theory and no spectrum was observed.

6685

THE DECOMPOSITION OF FATTY ACIDS BY ALPHA PARTICLES. Walter L. Whitehead, Clark Goodman, and Irving A. Berger. J. chim. phys. 48, 184-9(1951) Mar.-Apr.

A review is presented of work in which saturated fatty acids ranging from acetic (C_2) to melissic (C_{30}) were exposed in the solid state to the α radiation from radon. From the data presented it was concluded that the decarboxylation of fatty acids is a straight-line function of the size of the acid molecule between C_2 and C_{22}; that the dehydrogenation of the fatty acids by α particles is a complex function of the size of the acid molecule; that hydrocarbons present in crude oil can be produced by the radioactive decomposition of fatty acids ranging from C_2 to C_{30}; that temperature has little influence on the α-particle decomposition of palmitic acid below 0°C, while above this point decomposition increases with temperature.

RADIATION EFFECTS

6686

RADIOCHEMICAL EFFECTS ON LIQUIDS AND ON GASES. W. Mund and J. A. Herman. Bull. classe sci. Acad. roy. Belg. 37, 333-40(1951). (In French)

An experimental method is described which allows calculation of the effects of α radiation on the polymerization of vinyl chlorides in the liquid and the gaseous phase on a comparable basis. The number of chain reactions started are essentially the same in both phases.

6687

THE EFFECT OF SUPERVOLTAGE CATHODE RAYS ON p-AMINOBENZOIC ACID AND ANTHRANILIC ACID LABELED WITH C^{14}. Marion Corson, Samuel A. Goldblith, Bernard E. Proctor, John R. Hogness, and Wright H. Langham. Arch. Biochem. Biophys. 33, 263-9(1951) Sept.

Supervoltage cathode rays decarboxylated p-aminobenzoic acid (PABA) and anthranilic acid at approximately the same rates. These radiations resulted in loss of amine function of PABA and anthranilic acid, and the losses occurred at the same rates. The rate of decarboxylation was lower than the rate of loss of amine function. (auth)

6688
SOME ASPECTS OF THE BIOCHEMICAL EFFECTS OF IONIZING RADIATIONS. W. M. Dale. J. chim. phys. 48, 245-8(1951) May-June.

Previous work on the deamination of amino acids by x-rays is summarized and recent experimental results of deamination of sulfur-containing amino acids is discussed. It has been determined that x radiation splits off H_2S from cysteine and glutathione. These results are of significance in view of the role attributed to the oxidation of thiol groups in glutathione and protein for the inactivation of SH enzymes. It is shown that the radiation effect does not consist solely of an oxidation of SH groups to disulfides but H_2S is produced in preference to deamination in the case of cysteine.

6689
PRODUCTION OF JOSHI EFFECT IN IODINE VAPOUR UNDER X-RAYS. V. G. Bhide. Current Sci. (India) 20, 178-9(1951) July. (Letter to the editor)

A negative Joshi effect (Current Sci. (India) 13, 278(1944)) has been observed with iodine vapor on irradiation by x rays. The following results were observed: while the effect is definite under x rays, its range of occurrence and magnitude are determined by applied potential, nature, and concentration of the ex ited material; intensity and hardness of the x rays; and frequency response of the detector circuit. The relative Joshi effect increases with the increase in the voltage on the x-ray tube. With the increase of the intensity, I, the negative effect rises from an almost negligible value at low I, to a maximum at a tube current of about 2.0 ma; thereafter it decreases and then changes sign at high I (6 to 9 ma). A like reversal at large I (tube current 12 ma) was observed in bromine vapor. The results are interpreted according to Joshi's theory (Current Sci. (India) 16, 17(1947)).

6690
EFFECTS OF HIGH-VOLTAGE CATHODE RAYS ON AQUEOUS SOLUTIONS OF HISTIDINE MONOHYDROCHLORIDE. D. S. Bhatia and B. E. Proctor. Biochem. J. 49, 550-3(1951) Sept.

Aqueous solutions of histidine monohydrochloride containing 100 to 1000 μg/ml were irradiated with high-voltage cathode rays at levels of 100,000, 250,000, 500,000, and 1,000,000 rep. Histidine was decomposed at all concentrations, and the decomposition was related exponentially to the dosage of irradiation. The ionic yields ranged from 0.34 to 3.4 over the range of concentrations studied. It is concluded that the cathode rays decompose histidine through deamination of the α-amine group and fission of the imidazole ring.

6691
THE EFFECT OF X-RAY INTENSITY ON THE RADIATION OF $KMnO_4$. L. Bloch-Frankenthal and G. Goldhaber. Bull. Research Council Israel 1, 117-18(1951) Mar. (Letter to the editor)

A very dilute solution of $KMnO_4$ in dilute H_2SO_4 was exposed to x rays of varying intensity. Results point to an inverse relationship between the intensity at which an x-ray dose is applied and the extent of $KMnO_4$ reduced by it to Mn^{++} salt. This phenomenon may be explained by assuming that with increasing intensity of irradiation there is a greater chance of the active radicals obtained combining with one another than with the solute molecules, and this process would result in a diminished ionic yield.

RARE EARTHS AND RARE-EARTH COMPOUNDS

6692
ON REMOVAL OF THE UNCERTAINTY IN OBSERVATIONS OF THE DECOMPOSITION PRESSURE OF AMMINES. THE AMMINES OF THE LANTHANUM CHLORIDE–AMMONIA SYSTEM. G. F. Hüttig and W. Dauschan. Monatsh. 82, No. 4, 742-7(1951) Aug. 15. (In German)

The pressure-composition isotherm of the $LaCl_3$-NH_3 system has been measured to 220 atm at 195°C. The existence of $LaCl_3.8NH_3$ was not demonstrated, but this substance was found at 150°C at a NH_3 pressure of 140 atm. $LaCl_3.6NH_3$ has a decomposition pressure of ~80 atm at 195°C; the Q estimated from this is 13,000 cal. $LaCl_3.5NH_3$ and $LaCl_3.3NH_3$ do not exist. $LaCl_3.4NH_3$ has a decomposition pressure of ~40 atm at 195°C; Q≈13,650 cal. The existence of $LaCl_3.2NH_3$ is definite; the decomposition pressure is below 1 atm at 195°C. The question of the existence of $LaCl_3.NH_3$ cannot be answered by this experiment. The maximum coordination number of La (8) is discussed in relation to those of other rare earths; a parallelism between these numbers and the atomic volumes, rather than the ionic radii, is noted.

6693
THE DIFFERENTIAL DIFFUSION COEFFICIENT OF LANTHANUM CHLORIDE IN DILUTE AQUEOUS SOLUTION AT 25°. Herbert S. Harned and Charles A. Blake, Jr. J. Am. Chem. Soc. 73, 4255-7(1951) Sept.

The differential diffusion of lanthanum chloride in water at 25° has been determined by the conductometric method through a concentration range of 0.00093 to 0.026M. The results are all somewhat lower than those computed by the theory of Onsager and Fuoss but appear to approach the limiting law of the theory in a satisfactory manner. (auth)

6694
REFLECTION ABSORPTION SPECTRA OF SEVERAL SOLID COMPOUNDS OF RARE EARTHS. Françoise Boulanger. Compt. rend. 233, 650-1(1951) Sept. 17. (In French)

The diffuse reflection spectra of solid $Nd(OH)_3$, Nd_2O_3, $3Al_2O_3.Nd_2O_3$, $Al_2O_3.Nd_2O_3$, $Al_2O_3.2Nd_2O_3$, $Pr(OH)_3$, and $Al_2O_3.Pr_2O_3$ are shown. The existence of a Nd aluminate of the type $NdAlO_3$ is indicated.

6695
OBSERVATIONS ON THE RARE EARTHS. LXI. PRECIPITATION OF HYDROUS OXIDES OR HYDROXIDES FROM PERCHLORATE SOLUTIONS. Therald Moeller and Norman Fogel. J. Am. Chem. Soc. 73, 4481(1951) Sept. (Note)

Numerical data characterizing the titrations of La, Pr, Nd, Sm, Eu, Gd, Y, Er, Yb, and Lu are tabulated. The differences in basicity between ions of adjacent elements are somewhat better defined, and the well-known excessively high basicity of La ion is somewhat more apparent for perchlorate solutions. Titration data for perchlorate solutions support the theoretical basicity order for these cations and place Y in its logical place between Gd and Er. That precipitation was complete in all cases at OH^-:R^{+3} mole ratios of 2.60 to 2.75 suggests basic salt formation to be at a minimum in perchlorate solutions.

SEPARATION PROCEDURES

6696
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
NUCLEAR CHEMISTRY (INORGANIC) GROUP, p.29-44 of PROGRESS REPORT; AUGUST 31, 1951. 16p. (NP-3391 (p.29-44))

Extensive scintillation-counting data have been obtained and analyzed for crystals of some 27 organic compounds. The final mean average-pulse-height values are presented. Three materials—pyrene, carbazole, and diphenylene oxide—were found to lie in the range between stilbene and anthracene. Two methods of separation of ions by electromigration in ion-exchange resins are described. A strip of a Permionic CR-51 membrane in the Na form was clamped between zinc electrodes in a cell made of plexiglas and

polystyrene designed for this purpose. In the middle of the membrane a narrow band was traced with 2.6-yr Na^{22}. The displacement of the activity maximum was found to be proportional to the charge passed. The final displacement after passage of 13.86 ma-hr was 3.3 ± 0.3 cm. The results of an electrolysis experiment of the system ⊕ Pt | Hr | NaR | Hr | Pt ⊖ are shown. R denotes one equivalent of Amberlite IRC-50. Radiochemical studies of fission products have led to no final conclusions except the establishment of an upper limit of 1×10^{-3}% for the independent fission yield of Nb^{96}. Relative formation cross sections of the isomeric pair 4.4-hr Br^{80m} and 18-min Br^{80} as a function of energy reported in the May 31 Progress Report have been found to be in error, and the correct excitation curves for several Br^{80} reactions are shown. β,β′-dichlorodiethyl ether has been used for extraction of Ga(III) from aqueous hydrochloric acid solutions. A study of the distribution coefficient as a function of acid concentration and Ga(III(concentration showed a sharp increase in the K_D from 0.094 at 2.2N acid to about 300 at 7.0N acid.

6697

Pittsburgh Univ.

CHROMATOGRAPHIC SEPARATION OF METALLIC CHELATES; by Leland Hilliard and Henry Freiser. Aug. 16, 1951. 7p. (NYO-738)

Various metallic derivatives of 8-hydroxyquinoline (oxine) were dissolved in chloroform, adsorbed on a prepared silica column, and eluted with chloroform and chloroform-ethanol mixtures. In most cases the chelates formed distinct, separably elutable bands. For oxinates in chloroform, the adsorption sequence following oxine in order of increasingly strong adsorption by silica was Cu, Co, Fe, Al, Bi, Ni, and Pb oxinates.

6698

Argonne National Lab.

SEPARATION OF D-GLUCOSE FROM THE HYDROLYSIS PRODUCTS OF SCENEDESMUS CELLS; by John W. E. Glattfeld. Aug. 1951. 2p. (AECU-1664; UAC-430)

The report is reproduced here in its entirety.

This note records a procedure that was used by the author for the separation of D-glucose in crystalline form from the products of the hydrolysis of Scenedesmus cells with dilute sulfuric acid.

The cells were harvested by centrifugation and dried at 80°C. They were extracted exhaustively, first with 80% ethanol and then with absolute methanol. They were then stored in a vacuum desiccator ovér sulfuric acid until the weight was constant.

The amount of cells used in the hydrolysis experiment was 50 g; the quantity of 1N sulfuric acid, 250 cc; and the refluxing period, 20 hr. The part that did not go into solution was separated by use of the centrifuge and weighed 17.3 g after drying so that, by difference, 32.7 g of the sample dissolved.

The supernatant liquid was freed of sulfate ion by means of barium hydroxide. After the barium sulfate was removed by centrifugation the liquid was passed through a column of the monobed resin Amberlite MB-3. Since the color of the solution was not removed by the Amberlite, the effluent was passed through a decolorizing resin, Permutit-DR. This removed all the color. It was then again passed through Amberlite MB-3. It had been previously shown with pure glucose solutions that neither Amberlite MB-3 nor Permutit-DR retains more than 10% of the sugar. The volume of the clear, colorless effluent was 6600 cc. The solution contained, by analysis, 6.0 g of reducing material calculated as glucose. It was distilled at reduced pressure and left 7.43 g of clear, but slightly yellow, stiff gum. Since this contained 6.0 g of material calculated as glucose, the sugar content was 80.7%.

The gum was now dissolved by heating it with a mixture of 6 cc of water and 60 cc of absolute ethanol, and the solution was filtered to remove a small amount of flocculent material. The filtrate was crystal clear but faintly yellow. It was seeded with glucose crystals and the sides of the flask were scratched with a glass rod. Almost 18 hr elapsed before crystallization started along the scratches. It then proceeded rather rapidly. After 27 hr from the time of seeding, the first crop of crystals was harvested. It was pressed down on the suction filter but not washed. The mother liquor and rinsings were distilled to dryness at reduced pressure, the residue again taken up in a mixture of 1 part of water and 10 parts of absolute ethanol, and the procedure outlined above repeated. In this way a total of 1.92 g of white crystalline material was obtained in three crops.

The 1.92 g of crude material was recrystallized from a mixture of 2 cc of water and 20 cc of absolute ethanol and yielded 1.0 g of snow-white granular crystals with the following constants:

$[\alpha]_D^{20}$ at equilibrium, +52.7; melting point, 145 to 146°; melting point of an authentic sample of glucose, 146 to 147°; melting point of a mixture of the two, 145 to 146°.

A chromatogram of the recrystallized material was prepared by William Chorney, a member of the Argonne staff; it showed the presence of glucose only, with no other contaminating sugars.

These results leave little doubt that the sugar thus separated from the hydrolysis products of Scenedesmus was D-glucose.

6699

Stanford Research Inst.

CONTINUOUS SEPARATION OF IONS BY MEANS OF A MOVING ION EXCHANGE BED; COVERING PERIOD JUNE 25, 1950–JANUARY 31, 1951 (Technical Report No. 6, SRI Project No. CU-337); by Nevin K. Hiester. Mar. 30, 1951. 113p. (COO-41(rev.))

The forms of the equations describing the kinetics and equilibria of ion-exchange processes are reviewed. Design theories for predicting the behavior of both fixed-bed and moving-bed operation are discussed. Among these is a set of equations based on a simple rate mechanism for the exchange of trace components which predicts the behavior of moving-bed units for both ion removal and ion separation. Operating characteristics for three separate models of the apparatus have been determined. A model involving a mechanical lift system for the transfer of the resin has proved most successful. Experimental runs definitely show the feasibility of both the separation and removal steps of the process. Runs involving top and bottom reflux in the separation step have verified the necessity for utilization of reflux. Excellent separation of ions has been obtained under reflux conditions.

6700

EXTRACTION OF CERIC NITRATE BY SOLVENTS. A. W. Wylie. J. Chem. Soc., 1474-80(1951) June.

It is shown that ceric nitrate can readily be extracted into ethyl ether if the solution is made 5 to 6N in nitric acid and if peroxide-free solvent is employed. The method is convenient for separation of small quantities of pure Ce from mixtures of lanthanon nitrates. These nitrates, which are inappreciably extracted under the conditions used, act as mild "salting out" agents for ceric Ce. The complex is shown to consist of $H_2[Ce(NO_3)_6]$ or a mixture of this substance and $H[Ce(NO_3)_5(H_2O)]$. Extraction of nitric acid in various solvents has been investigated, and the results

have been interpreted in terms of the structure of the solvents and the formation of oxonium nitrates. Notable extraction of Ce is found only in solvents which readily extract nitric acid from aqueous solutions. It is considered that the complex, though largely un-ionized, may be held in the solvent phase by van der Waals and oxonium-type forces. (auth)

6701

LIQUID-LIQUID EXTRACTION ANALYSIS. Calvin Golumbic. Anal. Chem. 23, 1210-17(1951) Sept.

This review of the present status of liquid-liquid extraction begins with a brief discussion of single and multiple contact extraction. The basic theory of countercurrent distribution is then developed, and the apparatus required and the selection of a solvent system are considered. The scope, advantages, limitations, and recent applications of countercurrent distribution are described. 73 references.

6702

ANION EXCHANGE OF ZIRCONIUM, HAFNIUM, NIOBIUM, AND TANTALUM IN HYDROCHLORIC ACID SOLUTIONS. E. H. Huffman, G. M. Iddings, and R. C. Lilly. J. Am. Chem. Soc. 73, 4474-5(1951) Sept. (Note)

Zr, Hf, Nb, and Ta form complex chloro-ions in strong hydrochloric acid which can be exchanged on anion-exchange resins. The characteristics of these exchanges are reported. The different characteristics of Zr and Nb have led to a very convenient separation of Zr^{95} from its daughter Nb^{95}. The mixture in 6 to 7M HCl is passed through a Dowex-2 column and washed with more acid. The elutriant and wash contain the Zr. The Nb is then washed from the column with 1.5 to 4.0M HCl.

6703

THE QUANTITATIVE SEPARATION OF SULFUR HEXAFLUORIDE AND GASEOUS FLUOROCARBONS. Jean Neudorffer. Compt. rend. 232, 2102-4(1951) June 4. (In French)

As part of a study of the fractionation of CF_4, C_2F_6, C_3F_8, C_4F_{10}, and SF_6 by consecutive evaporation, the vapor pressure of SF_6 has been determined between −160 and −63.8°C (1 atm) and fitted by the formula $\log p(mm) = 2.78753 - 624.69/T + 0.014731T$. A small amount of data on the vapor pressures of the fluorocarbons from −175 to −115°C is given, and separations obtained by this method are tabulated.

SYNTHESES

6704

Los Alamos Scientific Lab.

MICRO SYNTHESIS WITH TRACER ELEMENTS; VIII. THE SYNTHESIS OF 2-METHYL-C^{14}-1,4-NAPHTHOQUINONE (PROVITAMIN K); by Arthur Murray III, and Anthony R. Ronzio. [nd] 19p. (AECU-1667; LADC-1051)

The methyl group in position 2 of 1,4-naphthoquinone is essential for vitamin K activity. Labeling the methyl group at this location should be the easiest method for introducing C^{14} into the compound. All common methods for the synthesis of 2-methyl-naphthalene and oxidation to the quinone have been investigated. The 2-methyl-C^{14}-1,4-naphthoquinone synthesized possessed a specific activity of 57.4 mg/mc. A simple method for the synthesis of methyl-C^{14} iodide is also described. (auth)

6705

Harvard Univ. Medical School

THE METABOLISM OF C^{14}-LABELED GLUCOSE AND PYRUVATE BY RAT DIAPHRAGM MUSCLE IN VITRO; by Claude A. Ville, Vivien K. White, and A. Baird Hastings. [nd] 22p. (AECU-1656)

The glucose and pyruvate utilization, glycogen synthesis, lactate accumulation, and metabolism of glucose and pyruvate to carbon dioxide by isolated rat diaphragm were measured in muscle removed from normal or from diabetic and adrenalectomized rats and incubated in a phosphate-saline buffer containing glucose and pyruvate. Reactions are reported in detail. In all three samples of muscle, the addition of insulin increased glucose utilization, glycogen synthesis, and the amount of glucose metabolized to CO_2. Chemical evidence is presented that muscle has no glucose-6-phosphatase and no enzyme for phosphorylating glycerol. The experimental evidence accords with the theory that insulin produces a stimulation of the hexokinase system and that it has an additional effect on one or more of the reactions involved in the condensation of pyruvate with oxalacetate to enter the citric acid cycle.

6706

Sloan-Kettering Inst. for Cancer Research

SOME SYNTHETIC ANALOGS OF THE NATURAL PURINE NUCLEOSIDES; by John Davoll and Bertram A. Lowy. [nd] 13p. (AECU-1658)

The synthesis of a number of 9-glycosylpurines is reported, namely, 9-β-D-ribopyranosyladenine, 2,6-diacetamido-9-triacetyl-β-D-ribopyranosylpurine, 2,6-diamino-9-β-D-ribopyranosylpurine, 2-acetamido-6-amino-9-β-D-ribopyranosylpurine, 9-β-D-ribopyranosylguanine, 2,6-diamino-9-β-D-xylofuranosylpurine, 2-methylthio-9-β-D-ribofuranosyladenine, 2-methyladenine, 2-methyl-9-β-D-ribofuranosyladenine, 2-chloroadenine, 2-chloro-9-β-D-ribofuranosyladenine, 9-α-L-arabofuranosyladenine, 2,8-dichloro-9-tetraacetyl-β-D-glucopyranosyladenine, 2,6,8-trichloro-9-tetraacetyl-β-D-glucopyranosylpurine (shown to be identical with the trichloropurine tetraacetyl glucoside of Fischer and Helferich (Ber. 47, 210(1914))), and 2,6,8-trichloro-9-triacetyl-β-D-ribofuranosylpurine.

6707

Ames Lab.

SYNTHESIS OF NEW ORGANIC ANALYTICAL REAGENTS; by Roy Henry Kinsey. Dec. 12, 1949. 46p. (ISC-91)

An investigation of the preparation of three organic compounds, 2,2′-bipyrimidyl, 1,4-bis-(cyclohexoxy)-2,3-butanedionedioxime, and 2,2′-thenildioxime, analogs of useful analytical reagents in the specific or selective separation and/or determination of divalent metal ions has been carried out. 2,2′-Bipyrimidyl was not obtained by any of the methods investigated. Two new compounds, 2-chloropyrimidine and 2-bromopyrimidine were prepared and identified. The preparation of 1,4-bis-(cyclohexoxy)-2,3-butanedionedioxime was unsuccessful. However, some evidence for a molecular rearrangement of the intermediate carbonium ion was obtained from the analysis of the products of the reaction. 2,2′-Thenil was prepared by the acylation of thiophene by oxalyl chloride with anhydrous $AlCl_3$ as a catalyst. Yields of 5 to 12% were obtained by this method. The oximation of 2,2′-thenil produced a white crystalline compound which has the characteristics of a dioxime. An alcoholic solution of this compound in the presence of nickelous ions produced a bright-orange-colored precipitate. Palladous ions were similarly observed to form a yellow-colored precipitate. (auth)

6708

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

NUCLEAR CHEMISTRY (ORGANIC) GROUP, p.46-48 of PROGRESS REPORT; AUGUST 31, 1951. 3p. (NP-3391 (p.46-48))

The solvolysis of pure endonorbornyl-2,3-C^{14} bromobenzenesulfonate in glacial acetic acid yielded norbornyl acetate in which the 2- and 3-positions contained but 44% of the original activity, i.e., 56% rearrangement. The pure exoisomer under identical conditions underwent 60% re-

arrangement. In 98 to 100% formic acid, a more highly ionizing solvent, the endoisomer underwent rearrangement to the extent of 66%. 2,3,3-Trimethyl-2-butanol-1-C^{14} has been prepared by the reaction of methyl-C^{14}-magnesium iodide and pinacolone. A degradation procedure is shown for the product of the aluminum bromide–catalyzed isopentane rearrangement. The reaction of ethyl diazoacetate with deuteroacetic acid (CH_3COOD) yielded ethyl acetoxyacetate in which the amount of deuterium approached two atoms per molecule with increasing CH_3COOD concentration. This was observed even in a medium of 90% (by volume) benzene.

6709

THE SYNTHESIS OF METHYLAMINE-C^{14} AND DIAZOMETHANE-C^{14}. R. D. H. Heard, J. R. Jamieson, and S. Solomon. J. Am. Chem. Soc. 73, 4985-6(1951) Oct. (Note)

Methylamine-C^{14} was prepared by hydrogenation of $NaC^{14}N$ in the presence of a slight excess of HCl and freshly prepared Adams-Shriner platinum oxide catalyst. From this, nitroso-C^{14}-methylurea was formed by refluxing with urea and addition of $NaNO_3$ and H_2SO_4. The nitroso-C^{14}-methylurea was decomposed by KOH solution to yield diazomethane-C^{14}. The over-all yield of diazomethane from cyanide was 41 to 42%.

6710

PREPARATION OF C^{14}-CARBOXYL-LABELED SODIUM ACETATE. Jésus Anatol and Jean Coursaget. Compt. rend. 233, 488-90(1951) Aug. 6. (In French)

Syntheses of $CH_3C^{14}OONa$ in 92% yield from $C^{14}O_2$ by a Grignard reaction and α-amino-γ-phenylbutyric acid in 93 to 95% yield by alkaline hydrolysis of 5-phenethylhydantoin are described.

6711

THE PURITY OF DIIODOFLUORESCEIN-I_2^{131}. Arthur Roe, Raymond L. Hayes, and H. D. Bruner. J. Am. Chem. Soc. 73, 4483-4(1951) Sept. (Note)

The preparation of diiodofluorescein-I_2^{131} as reported by Boyack, Moore, and Clausen (Nucleonics 3, No. 4, 62(1948)) by iodination of fluorescein with I_2^{131} monochloride was adapted to the preparation of 3,5-diiodo-4-pyridone-I_2^{131}. The product obtained contained chlorine as well as iodine; it was found necessary to decrease greatly the excess of dichloramine-T in order to obtain the desired chlorine-free diiodopyridone. Checking the Boyack, Moore, and Clausen method for possible chlorination as well as iodination was accomplished by preparing samples according to their directions except that no I_2^{131} was used. The sample was analyzed for chlorine and iodine. Calcd. for $C_5OH_{10}O_5I_2$: I, 43.46; Cl, 0.00. Found: I, 35.96, 36.15; Cl, 7.75, 7.80. It was not possible to prepare pure diiodofluorescein-I_2^{131}, using Roe, Hayes, and Bruner's method (J. Elisha Mitchell Soc. 66, 163(1950) for 3,5-diiodo-4-pyridone-I_2^{131}.

6712

PREPARATION OF DEUTERIOTHIOPHENES BY HYDROGEN EXCHANGE. H. Schreiner. Monatsh. 82, No. 4, 702-7(1951) Aug. 15. (In German)

Tetradeuteriothiophene was prepared by hydrogen exchange between thiophene and heavy, 69 wt. % sulfuric acid, made by the reaction of SO_3 with D_2O. Exchange equilibrium was almost reached (99%) after 100 hr of continuous shaking at room temperature or 30 hr at 40°C. Attempts to partially deuterate thiophene always resulted in a mixture of mono-, di-, and trideuteriothiophene.

6713

THE SYNTHESIS OF ETHYLENE OXIDE-1,2-C^{14}. Arthur J. Tomisek and Henry R. Mahler. J. Am. Chem. Soc. 73, 4685-6(1951) Oct.

Ethylene oxide-1,2-C^{14} was isolated in 30% yield from the reaction of ethylene-1,2-C^{14} with perbenzoic acid in tetrachloroethane solvent in the presence of iodine catalyst. A procedure was developed for the determination of ethylene oxide in tetrachloroethane solutions. (auth)

6714

TRANSFORMYLATION IN THE SYNTHESIS OF ADENINE-8-C^{14}. Richard Abrams and Leon Clark. J. Am. Chem. Soc. 73, 4609-10(1951) Oct.

It has been possible to demonstrate by means of C^{14}-labeling that when 4,6-diamino-5-formamidopyrimidine is heated in N-formylmorpholine, half the carbon atoms in position 8 of the resultant adenine come from the formamidopyrimidine and half from the N-formylmorpholine. These results can best be accounted for by assuming the intermediary formation of 6-amino-4,5-diformamidopyrimidine which then randomly loses one of the formyl groups to yield adenine. To synthesize adenine-8-C^{14} and avoid the 50% loss of isotope inherent in the use of formylmorpholine, two methods have been found satisfactory: (1) 4,5,6-triaminopyrimidine sulfate heated with an equimolar amount of formyl-labeled N-formylmorpholine gives adenine in 92% yield; (2) 4,6-diamino-5-formamidopyrimidine sulfate labeled in the formyl carbon heated with diethanolamine forms adenine in 75% yield. (auth)

6715

THE APPLICATION OF RADIOCARBON IN THE STUDY OF RADIOLESIONS. G. Hevesy. J. chim. phys. 48, 275-9(1951) May-June.

The effect of x irradiation upon metabolic processes as demonstrated by C^{14} incorporation into body metabolites is discussed. It is pointed out that the most spectacular effect observed shortly after irradiation is mitotic arrest. The explanation is suggested that such arrest is not due alone to an interference with molecular rearrangement during the mitotic process, but to an interference with the synthetic processes of cellular constituents which wholly or partly takes place during interphase. The effect of irradiation upon C^{14} incorporation into the purines of desoxyribonucleic and of ribosenucleic acid and other tissue constituents is discussed.

TRACER APPLICATIONS

6716

DEGRADATION OF ISOTOPICALLY LABELED CITRIC, α-KETOGLUTARIC AND GLUTAMIC ACIDS. E. H. Mosbach, E. F. Phares, and S. F. Carson. Arch. Biochem. Biophys. 33, 179-85(1951) Sept.

A new step by step degradation procedure for citric, α-ketoglutaric, and glutamic acids has been described. The method permits the determination of the isotope concentration of each individual position of the carbon chain of these acids. The formation of symmetrical intermediates has been avoided through the conversion of glutamic acid to butyric acid via succinic acid semialdehyde. The validity of the method has been established with α-ketoglutaric acid-1, 2-C^{14} and a biosynthetic sample of labeled citric acid. (auth)

6717

DEGRADATION OF LABELED PROPIONIC AND ACETIC ACIDS. E. F. Phares. Arch. Biochem. Biophys. 33, 173-8(1951) Sept.

A procedure for the stepwise degradation of the lower, straight-chain, saturated fatty acids has been developed which utilizes the Schmidt reaction for decarboxylation of the acid, followed by permanganate oxidation of the resulting amine. The adaptation of this method to the assay of isotopic concentrations of individual carbon positions of propionic and acetic acids on a semimicro scale is described.

Radioactivity measurements on the degradation products of C^{14}-labeled acetic and propionic acids have shown a very

low cross-contamination between individual carbon positions. (auth)

6718
PHOSPHORUS COMPOUNDS IN THE CELL. I. PROTEIN-BOUND PHOSPHORUS FRACTIONS STUDIED WITH THE AID OF RADIOACTIVE PHOSPHORUS. J. N. Davidson, S. C. Frazer, and W. C. Hutchison. Biochem. J. 49, 311-21 (1951) Aug.

Tissues, chiefly liver, from rats and rabbits injected with P^{32} were fractionated and the specific activities of the various phosphate fractions determined. The specific activities of the nucleic acids were invariably lower than the specific activities of the fractions which contained them. After evaluation of the Schmidt-Thannhauser and the Schneider separation procedures it was concluded that the only way to determine the true specific activity is to isolate the nucleic acids in a rigorously purified form. Details of procedures and results obtained in the study are included.

URANIUM AND URANIUM COMPOUNDS
6719
DOUBLE FLUORIDES OF URANIUM HEXAFLUORIDE. H. Martin, A. Albers, and H.-P. Dust. Z. anorg. u. allgem. Chem. 265, 128-38(1951) June. (In German)

UF_6 forms complex salts at room temperature or about 100°C with a number of other fluorides, in particular with AgF and the alkali fluorides (except LiF). Investigations of the preparation of such salts, as well as complex salts with metals of higher valence, are reported. The double salts $3AgF.UF_6$, $3NaF.UF_6$, $3KF.2UF_6$, and $2RbF.UF_6$(?) are described. CaF_2, BaF_2, ZnF_2, CdF_2, and BiF_3 do not react appreciably with UF_6 at room temperature. All the fluorouranates hydrolyze in H_2O. No appreciable decomposition pressure is found up to 100°C. At higher temperatures the Na and K salts give off UF_6 and F_2; fluorouranates(V) are probably produced. The applicability of HF- or H_2O-binding substances (NaF, KF, RbF, BiF_3, P_2O_5, $Mg(ClO_4)_2$) as stabilizing agents for UF_6 preparations stored in glass vessels vessels is discussed.

ENGINEERING

6720
Brookhaven National Lab.
PROGRESS REPORT ON WASTE CONCENTRATION STUDIES; V. ENGINEERING RESULTS ON THE BNL SEMI-WORKS VAPOR FILTRATION VAPOR COMPRESSION EVAPORATOR; by R. V. Horrigan and H. M. Fried. Aug. 15, 1951. 25p. (BNL-121)

This report describes the results of all experimental "hot" runs made with the BNL-modified Cleaver-Brooks DVC-8E Vapor Compression Still. An engineering estimate is given of the feasibility, reliability and operating costs of the vapor compression process applied to the concentration of dilute radioactive liquid waste. A study was made of liquid entrainment released into the vapor from radioactive solutions boiling in a vertical tube evaporator. Fiberglas filter material, a cyclone separator and a vapor dome baffle are evaluated as de-entraining agents. Results on the intermediate concentration of laboratory D waste are given and the proposed method of concentrate storage is described. (auth)

6721
Atomic Energy Research Establishment, Harwell, Berks (England)
THE MEASUREMENT OF MEAN SURFACE TEMPERATURE BY HIGH FREQUENCY INDUCTION; by P. Fortescue and D. M. Harris. July 12, 1951. 13p. (AERE-E/R-720)

The method of surface temperature measurement described depends on the fact that the resistive component of the impedance of a coil varies with the resistivity of any conducting body placed within it and, if the frequency employed in measurement is high enough, only the surface resistivity, which depends on surface temperature, is important. A simple theoretical formula is developed relating the magnitude of the effect to the proportions of the pick up coil. This is directly applicable to the use of the method in measuring surface temperatures of cylindrical or tubular specimens located in annular cooling channels, outside which the pick-up coil is situated. The result is checked experimentally, and in the particular case of 1½-in. diam Cu tube, surrounded by a 2-in. diam single layer coil, it has been found possible to measure surface temperatures to a degree centigrade without much difficulty. The direct effect of temperature on the coil, and of errors resulting from nonconcentricity are discussed. (auth)

6722
RADIOISOTOPES—INDUSTRIAL APPLICATIONS. G. H. Guest. New York, Pitman Publishing Corp., 1951. 185p.

The properties of radioisotopes are described in simple terms, and possible uses in industry are pointed out. The various industrial uses, such as radiography and β thickness gauges, are explained in separate chapters.

6723
STRESSES IN PIPE BUNDLES. H. Poritsky and G. Horvay. J. Applied Mechanics 18, 241-50(1951) Sept.

For the purpose of stress analysis, a closely packed bundle of many pipes can be replaced by a homogeneous but nonisotropic solid. This paper deals with the derivation of the elastic constants of the homogeneous but nonisotropic solid, the solution of its stress problem under certain conditions, and the conversion of the results into stresses and displacement of individual pipes. As an example, the thermal stresses that arise in a pipe bundle due to a nonuniform axial temperature gradient are determined.

HEAT TRANSFER AND FLUID FLOW
6724
Massachusetts Inst. of Tech.
A STUDY OF THE MECHANISM OF BOILING HEAT TRANSFER (Technical Report No. 1); by Warren M. Rohsenow and John A. Clark. Feb. 1, 1950. 28p. (NP-3392)

An analysis of the heat quantity required to form a vapor bubble in a liquid is presented. High-speed motion pictures of boiling heat transfer in forced convection showing bubbles departing from a heated surface are analyzed and the net heat transferred to the bubbles is compared with the total heat transferred from the heated surface. It is found that the heat transferred to the moving liquid by the condensation of the bubbles is a negligible part of the total convective heat transfer. It is therefore proposed that the high rate of heat transfer associated with surface boiling in a subcooled liquid is due primarily to the violent agitation of the quiescent layers of liquid adjacent to the heated surface resulting

from the motion of vapor bubbles being generated there. From the literature two examples of similar processes are cited as evidence supporting the proposed agitation mechanism. (auth)

6725

Columbia Univ.

NATURAL CONVECTION TRANSFER PROCESSES; I. HEAT TRANSFER TO LIQUID METALS AND NON-METALS AT HORIZONTAL CYLINDERS; by Seymour C. Hyman, Charles F. Bonilla, and Stanley W. Ehrlich. [nd] 30p. (NYO-564)

Heat transfer by natural convection from a ½-in. diam horizontal cylinder to liquids was investigated. Fourteen liquids were employed, including the Pb-Bi eutectic, Hg, Pb, Bi, Na, and Na-K alloy. The Prandtl number of the liquids ranged from 0.0075 to 300. Both streamline and turbulent modes of flow were observed and equations to represent both were derived. Surface wetting had no appreciable effect on the heat transfer coefficient. A method for measuring the average surface temperature without interference with heat or fluid flow involved electroplating two different metals over the surface and measuring the thermoelectric potential developed between them.

6726

HEAT TRANSFER TO FLUIDIZED SOLIDS. R. A. Koble, J. N. Ademino, E. P. Bartkus, and T. E. Corrigan. Chem. Eng. 58, No. 9, 174-5(1951) Sept.

A preliminary study has been made of the heating of fluidized solids being transported through a concentric-pipe heat exchanger. The heat-transfer coefficient for condensing steam to coal-air mixtures was found to be a unique function of the mass velocity of the coal, varying with the 0.39 power. For limestone, the coefficient varied with both air velocity and solids velocity. The variation with air velocity was to about the 0.25 power, and with mass velocity to the 0.8 power. The positions of the corresponding curves, as well as the values of these exponents, suggest that the coal may have been in streamline flow and the limestone in transition or turbulent flow. Coefficients were in the range of 45 to 75, which is the same range as those reported for fluidized beds. This suggests that the tortuous movement of particles from the upper part of fluidized beds to the lower, and vice versa, is not the only reason for improved heat transfer found in fluidized systems.

6727

CONDITIONS SATISFIED BY THE EXPANSION AND VORTICITY OF A VISCOUS FLUID IN A FIXED CONTAINER. J. L. Synge. Quart. Applied Math. 9, 319-22 (1951) Oct.

In 3-dimensional motion of a viscous fluid inside a fixed container, the expansion θ and the vorticity ω cannot be arbitrarily assigned. Proof is given that a necessary and sufficient condition for the consistency of given θ and ω with vanishing velocity on the walls is $\int(\theta P + \omega_i Q_i)dV = 0$, where the integration is taken through the fluid, Q_i being any (arbitrary) solution of the partial differential equations $\Delta Q_i = Q_{k,ki}$ and P satisfying $P_{,i} = \frac{1}{2}\epsilon_{ijk}Q_{k,j}$. Here ϵ_{ijk} is the usual permutation symbol; the comma denotes partial differentiation, and Δ the Laplace operator, so that $\Delta Q_i = Q_{i,kk}$.

6728

ON THE ASYMPTOTIC BEHAVIOUR OF VISCOUS FLUID FLOW AT A GREAT DISTANCE FROM A CYLINDRICAL BODY, WITH SPECIAL REFERENCE TO FILON'S PARADOX. Isao Imai. Proc. Roy. Soc. (London) 208A, 487-516 (1951) Sept. 24.

The asymptotic behavior of flow at a considerable distance from an arbitrary cylindrical obstacle immersed in an otherwise uniform flow of an incompressible viscous fluid is considered on the basis of the Navier-Stokes equations. Carrying out the Oseen type of successive approximation to the third stage, the expression for the stream function is exactly determined to the order of r^{-1}, where r is the distance from some fixed point in or near the cylinder. Then, by considering the conservation of linear and angular momenta of the fluid enclosed between the cylinder and a large contour, exact analytical formulas for the lift, drag, and moment acting on the cylinder are obtained. Thus Filon's well-known paradoxical result that the moment of a cylinder immersed in a viscous flow comes out to be logarithmically infinite with increasing extent of the flow region is given a complete explanation, and the usefulness of the Oseen type of successive approximation in dealing with the Navier-Stokes equations is confirmed. (auth)

6729

STABILITY OF VISCOUS MOTION BETWEEN PARALLEL PLANES FOR FINITE DISTURBANCES. D. Meksyn and J. T. Stuart. Proc. Roy. Soc. (London) 208A, 517-26(1951) Sept. 24.

The linearized equation of motion and the equation of mean motion $\overline{uv} = Py + \mu(dU/dy)$ are solved simultaneously to find periodic solutions of finite amplitude. The expression U of the mean flow and the integrals ψ are interdependent; ψ, however, depends mainly on the value of U_0''/U_0' at the critical point. Accordingly, the linearized equation is solved for a set of values of U_0''/U_0'; for each case the critical point and corresponding critical Reynolds number are determined. These integrals, which are functions of U_0''/U_0', are inserted into the equation of mean motion; this leads to an equation between the amplitude of the vibration and the Reynolds number. To each Reynolds number there corresponds a definite value of the amplitude, a. For infinitesimal values of the amplitude the critical R is about 5000; and R is reduced with increase of the amplitude, reaching its minimum value of about 2900. The maximum value of u is about 11.5% of U(0), and the mean value of |u| across the channel is about 8.4% of the mean value of the main flow. The actual profile differs slightly from the parabola; the second derivative, however, is considerably changed. (auth)

6730

STUDIES ON TWO-DIMENSIONAL TRANSONIC FLOWS OF COMPRESSIBLE FLUID. PART III. S. Tomotika and K. Tamada. Quart. Applied Math. 9, 129-47(1951) July.

A theory is developed which is applicable in the study of a transonic flow containing limited supersonic regions as well as stagnation points. A hypothetical gas is introduced which is well capable of representing the real gas subject to the isentropic law. Experimental evidence seems to substantiate the validity of the theory.

6731

HEAT TRANSFER BETWEEN SOLIDS AND GASES UNDER NONLINEAR BOUNDARY CONDITIONS. W. Robert Mann and Frantisek Wolf. Quart. Applied Math. 9, 163-84(1951) July.

The boundary condition of Newton's law of cooling in the general form $k(\frac{\partial U}{\partial \eta}) = -f\Delta U$, where k is the thermal conductivity of the solid; $\frac{\partial U}{\partial \eta}$ is the thermal gradient, ΔU is the temperature difference between the surface and gas, and f is the factor of proportionality, is investigated when the boundary condition becomes nonlinear under the most general physically significant relationship between the film transfer factor and temperature.

6732

BOUNDARY LAYER IN CONVERGENT FLOW BETWEEN SPIRAL WALLS. G. Kuerti. J. Math. Phys. 30, 106-15 (1951) July.

The asymptotic form of Hamel's solution of $\nu\nabla^2\nabla^2\psi = \psi_y \nabla^2\psi_x - \psi_x\nabla^2\psi_y$, where ψ is the stream function, is shown to

be true for any width of channel and any degree of obliqueness of the spiral streamline, with the obvious exception that the spiral degenerates into a circle.

6733
A METHOD FOR THE CALCULATION OF HEAT TRANSFER IN SOLIDS WITH TEMPERATURE-DEPENDENT PROPERTIES. Robert Plunkett. Trans. Am. Soc. Mech. Engrs. 73, 605-8(1951) July.

The problem of heat transfer in a solid whose conductivity and specific heat depend on the temperature is converted by a simple change of variable to one in which the conductivity may be held constant, and only the specific-heat term varies with temperature in a way which depends upon the variation of both parameters. The method is illustrated by application to the case of essentially one-dimensional heat flow through a large brick furnace wall. The effect on the final solution of different finite approximations to the derivatives is also discussed.

6734
COMPRESSIBLE FLOWS WITH DEGENERATE HODOGRAPHS. J. H. Giese. Quart. Applied Math. 9, 237-46 (1951) Oct.

The theory of compressible fluids is developed for the case where the flow is assumed to be steady, isentropic, and irrotational. Characterizations of one- and two-dimensional hodographs are developed, and generalizations are found for the properties of several familiar compressible flows. As an example the construction of flows with axisymmetric degenerate hodographs is considered.

6735
CIRCULATION IN NONCOMPRESSIBLE VISCOUS LIQUIDS. Gabriel Viguier. Bull. classe sci. Acad. roy. Belg. 37, 397-405(1951). (In French)

The linear relationship between the forces of viscosity and the velocity of deformation in liquids is not valid in the case of high-velocity gradients. New equations, established elsewhere, are used here for calculation of such circulation, and results are compared with Carstoiu's classical hypothesis (Compt. rend. 224, 524(1947)).

6736
AN INVESTIGATION OF FLOW THROUGH SCREENS. W. D. Baines and E. G. Peterson. Trans. Am. Soc. Mech. Engrs. 73, 467-80(1951) July.

Analytical and experimental studies on the three principal aspects of flow through screens are described: (a) The relative drop in pressure as a function of screen form and solidity ratio; (b) the capacity of screens to modify the velocity distribution; and (c) the characteristics of the turbulence which screens produce. Because of their frequent hydraulic application, primary attention is given to relatively coarse lattices and perforated plates. Results are presented in dimensionless graphs which are immediately usable for design purposes. (auth)

6737
A STUDY OF THE MECHANISM OF BOILING HEAT TRANSFER. W. M. Rohsenow and J. A. Clark. Trans. Am. Soc. Mech. Engrs. 73, 609-20(1951) July.

An analysis of the heat quantity required to form a vapor bubble in a liquid is presented. High-speed motion pictures of boiling heat transfer in forced convection showing bubbles departing from a heated surface are analyzed and the net heat transferred to the bubbles is compared with the total heat transferred from the heated surface. It is found that the heat transferred to the moving liquid by the condensation of the bubbles is a negligible part of the total convective heat transfer. Therefore it is proposed that the high rate of heat transfer associated with surface boiling in a subcooled liquid is due primarily to the violent agitation of the quiescent layers of liquid adjacent to the heated surface resulting from the motion of vapor bubbles being generated there. From the literature two examples of similar processes are cited as evidence supporting the proposed agitation mechanism. (auth)

6738
A NEW METHOD OF DETERMINING THERMAL DIFFUSIVITY OF SOLIDS AT VARIOUS TEMPERATURES. D. Rosenthal and A. Ambrosio. Trans. Am. Soc. Mech. Engrs. 73, 971-4(1951) Oct.

A rapid means of determining thermal diffusivity, especially at high temperatures, is based on the theory of moving heat sources. When the theory is applied to the case of unidimensional heat flow in a long prismatic bar being heated by a moving point heat source, an equation which permits the computation of thermal diffusivity at each temperature is obtained. The experimental technique involves the measurement of the temperature-time history at a single point of the bar, using two different heat-source velocities. The values of thermal diffusivity of a brass specimen were determined in the range 100 to 400°C with a repeatability of ±3%. These computed values compare favorably with those found in the literature.

MATERIALS TESTING

6739
THE EFFECT OF INITIAL DEFORMATIONS ON THE BEHAVIOUR OF A CYLINDRICAL SHELL UNDER AXIAL COMPRESSION. P. Cicala. Quart. Applied Math. 9, 273-93(1951) Oct.

The theoretical investigation presented concerns the effect of certain initial deformations on the buckling under axial compression of thin plate structures. A general theory is developed and used to make approximate analyses of the complete cylinder and curved panel. Two extreme cases of the curved panel are treated: (a) uniform longitudinal shortening and (b) uniform longitudinal stress. Particular attention is paid to the possibility of inducing buckling in a favorable mode, and thus increasing the load which a structure can withstand. (auth)

RADIATION HAZARDS AND PROTECTION

6740
Los Alamos Scientific Lab.
EXHAUST VENTILATION ON MACHINE TOOLS USED ON MATERIALS OF HIGH TOXICITY; by H. F. Schulte, E. C. Hyatt, and F. S. Smith, Jr. [nd] Decl. Oct. 5, 1951. 9p. (AECD-3253; LADC-1040)

The following approximate concentrations ($\mu g/m^3$ of air) are the maximum permitted in Los Alamos machining operations: natural U, 50 ($3 \times 10^{-5} \mu c/m^3$); enriched U, 0.2 to 1.0 ($3 \times 10^{-5} \mu c/m^3$); Th, 100 ($3 \times 10^{-5} \mu c/m^3$); Be, 2; Tl, 150; Pb, 150. In addition to toxicity, conditions which must be considered in designing ventilating hoods are recoverability of material, pyrophoric danger, physical properties of metals and oxides, nature of operations, and ease of decontamination. Hoods for an enriched-U lathe, milling machine, index mill, shaper, power hack saw, handwork, break press, Be lathe, and Be grinder are illustrated. Data on ventilation and air concentrations are tabulated.

VACUUM SYSTEMS

6741
AUTOMATIC PRESSURE CONTROL DEVICE IN A HIGH-VACUUM PLANT. Mario Chiozzotto. Rend. ist. super. sanità 14, No. 8, 553-62(1951). (In Italian)

A device to regulate automatically the rotating pump which produces the preliminary vacuum required by the diffusion pump in a high-vacuum plant is described. This device guarantees an automatic closing of the vacuum plant

in case of a failure in the power supply to the rotary pumps. (auth)

6742

VACUUM TECHNIQUES AND ANALYSIS. Benjamin B. Dayton. p.333-86 of PHYSICAL METHODS IN CHEMICAL ANALYSIS. Vol. II. Walter G. Berl, ed. New York, Academic Press, Inc., 1951. 640p.

The production and measurement of low pressures and transfer of gases with diffusion and Toepler pumps are reviewed. The following unit operations are described in some detail as examples of vacuum technique: the vacuum-fusion method for the analysis of gaseous elements in metals, determination of carbon by low-pressure combustion, microanalysis of gases at low pressures, and analytical molecular distillation. 23 figures. 227 references.

6743

REFRIGERATION OF OIL DIFFUSION PUMP BAFFLES. R. S. Barton and A. H. Turnbull. Vacuum 1, No. 2, 117-18 (1951) Apr. (Letter to the editor; see also NSA 5-601 and 5-3417)

A 6-in. diffusion pump using Apiezon B oil was operated with a baffle refrigerated at −60 to +13°C. Ultimate pressures (measured as equivalent N_2 pressures) are plotted against baffle temperature, and the effect on speed of pumping dry N_2 is noted.

6744

INVESTIGATIONS INTO THE ULTIMATE PRESSURES OF DIFFUSION PUMPS DESIGNED TO PURIFY THEIR WORKING FLUIDS. D. Latham, B. D. Power, and N. T. M. Dennis. Vacuum 1, No. 2, 97-114(1951) Apr.

An oil-diffusion pump which powerfully purifies its fluid from contaminants and decomposition products can produce very low pressures as quickly with a fluid of commercial quality as it can with a specially prepared fluid. This is demonstrated by comparative tests on pumps designed to purify continuously their working fluids with varying efficiency and operated with proprietary pumping fluids and with commercial plasticizers. In a pump designed to keep the concentration of decomposition products in its fluid at a very low level, the rate of evolution of gaseous products is reduced, probably because intermediate products of fluid breakdown tend to be removed before they finally decompose into gases.

This new journal (Vacuum) is published four times a year by W. Edwards & Co., Ltd., London, England. Each issue contains comprehensive abstracts of world literature on vacuum apparatus, processing techniques using vacuum, and related subjects. Cumulative (for the year) subject and author indexes for these abstracts are included in each issue.

6745

A VACUUM VALVE FOR GLASS SYSTEMS. Joshua Stern. Rev. Sci. Instruments 22, 703-4(1951) Sept. (Laboratory and shop note)

A large, fast operating, high-vacuum valve is described for a glass or metal system. The valve, a piston fitted with a standard "O" ring, has two operating positions and is controlled by means of a rod passing through a vacuum seal. The system is connected to the rough vacuum pump when the rod is pushed in and to the high vacuum pump when the rod is pulled out.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

6746

CERAMICS. John H. Koenig and Nicholas H. Snyder. Ind. Eng. Chem. 43, 2208-17(1951) Oct.

Developments in a number of different types of ceramics—enameled products, glass, refractories, structural ceramics, whitewares, and high thermal shock ceramics—during the past year are reviewed. 59 references.

6747

REACTIONS IN THE SYSTEM TiO_2-SiO_2; REVISION OF THE PHASE DIAGRAM. R. W. Ricker and F. A. Hummel. J. Am. Ceram. Soc. 34, 271-9(1951) Sept.

Twenty-five compositions in the binary system were reacted in the solid state at temperatures ranging from 1000 to 1670°C and examined by x-ray and optical methods. Four compositions near the eutectic were melted to glasses and treated by the quench technique at a temperature of 1575°C. The data obtained indicate solid solution of approximately 10% TiO_2 in cristobalite at the eutectic temperature, and a relocation of the eutectic composition at 21.0 wt. % TiO_2. Solid solution of SiO_2 in rutile seems to be even more extensive, but the limit was not definitely established. The solution of TiO_2 in cristobalite causes the temperature of inversion to be lowered to 130°C; the magnitude of the volume change attending the inversion can be decreased to less than one-third the value for pure cristobalite. The physical properties of certain phases occurring in the system are discussed from the ceramic standpoint. (auth)

6748

REFRACTORIES BIBLIOGRAPHY, 1928-1947 INCLUSIVE. New York, American Iron & Steel Institute, and Columbus, Ohio, The American Ceramic Society Inc., 1950. 2109p.

More than 13,300 abstracts in this bibliography were prepared from 1150 periodicals and United States and foreign patent literature. The references are arranged alphabetically by authors, and a subject index is included. The bibliography supplements three bibliographies published by The American Ceramic Society, which covered magnesite and silica refractories in 1924 and the general subject of refractories in 1927.

6749

VAPOR DEPOSITION OF METALS ON CERAMIC PARTICLES. James E. Cline and John Wulff. J. Electrochem. Soc. 98, 385-7(1951) Oct.

The coating of ceramic particles with metal by vapor deposition was investigated for the production of high-temperature metal-ceramic bodies. Methods are described for coating particles of ceramics such as silica, silicon carbide, and alumina with molybdenum deposited by hydrogen reduction of molybdenum pentachloride and with nickel deposited by decomposition of nickel carbonyl. The particles must be kept in motion by gas flow or by mechanical agitation during the coating process. In the presence of titanium carbide the decomposition of nickel carbonyl proceeds abnormally, leading to the formation of carbon. (auth)

6750
THE PRODUCTION OF SINTERED ALUMINA WARE. T. G. Carruthers. Metallurgia 44, 103-7(1951) Aug.

The techniques used at Leeds University in slip casting, pressing, and firing alumina crucibles, tubes, and other wares satisfactory for normal high-temperature work are described.

6751
CRYOSCOPY OF SEVERAL METAL SILICATES IN MOLTEN CRYOLITE. Georges Petit. Compt. rend. 233, 615-17(1951) Sept. 10. (In French)

The dissociation in molten cryolite of forsterite (SiO_2.2MgO) zircon ($SiO_2.ZrO_2$), thorite ($SiO_2.ThO_2$), talc ($4SiO_2$.3MgO), enstatite (SiO_2.MgO), emerald ($6SiO_2.Al_2O_3.3BeO$), and other metal silicates has been studied. Emerald is shown to dissociate into 13 particles, probably $6SiO_2 + 2AlO_2^- + 3Be^{++} + 2O^{--}$. The formation of a metasilicate ion, SiO_3^{--} is suggested.

METALS AND METALLURGY

6752
General Electric Research Lab.
DEVELOPMENT OF ZIRCONIUM BASE ALLOYS; EIGHTH QUARTERLY REPORT (Progress Report Number 9); by J. H. Keeler. Oct. 5, 1951. 7p. (SO-2503)

Very brief note is made of recent progress in this program. Alloys of Zr with Cr, Mo, Nb, Fe, Ta, and Al have been produced. Ingots containing Cr, Fe, or Mo exhibit brittleness but those containing Ta or Al are being successfully cold rolled.

6753
Massachusetts Inst. of Tech.
FUNDAMENTALS OF COLD WORKING AND RECRYSTALLIZATION. (Technical Progress Report No. 4, Scope III); by B. L. Averbach and M. Cohen. June 1, 1951. 9p. (NYO-858)

Single-crystal specimens of a Cu-2% Si alloy were rolled parallel to the (110) face and with the [$\bar{1}$12] direction in the rolling direction in small steps to final reductions ranging from 5 to 95%. The crystals were etched to expose the center of the sheet. The Laue spots obtained became successively more diffuse as the deformation increased. The range of crystallite orientation was investigated by means of double-crystal rocking curves. The disorientation increased quite regularly as the deformation increased. The half-widths of the rocking curves as a function of deformation are tabulated. The average local distortion was studied by means of integrated intensity curves obtained from single crystals which had been plastically deformed and annealed. The average displacements obtained when the averaging distance is of the order of one unit cell are tabulated as a function of the amount of plastic deformation. The energy stored in the crystal by plastic deformation from these average displacements is included. Preliminary report is made of experiments on recovery and recrystallization on a single crystal of Cu-2% Si which had been cold-rolled 50%. The average distortions for the recovered and partially recrystallized crystals also were measured.

6754
General Electric Research Lab.
FUNDAMENTAL RESEARCH IN PHYSICAL METALLURGY; ELEVENTH QUARTERLY REPORT (Progress Report Number 28); by J. H. Hollomon and D. Turnbull. Oct. 5, 1951. 8p. (SO-2018)

Since recent reports have indicated that partial pressures of O_2 greater than 10^{-5} to 10^{-6} atm decrease the surface tension of solid Ag, the presence of O_2 traces might have affected the measured grain-boundary diffusion coefficients. Several Ag samples were heated in a maintained vacuum of 10^{-7} mm Hg. No significant effect on these coefficients was noted, indicating that reported values are correct. It has been found that if single crystals of brass and Cu are first heated to 700°C and a load of 200 psi is then gradually added, the crystals will weld without recrystallizing. Preliminary data indicate a T^2 dependence of the low-temperature specific heat of natural crystalline graphite. No apparent particle-size effect has been detected down to 16°K.

6755
North American Aviation, Inc.
THE THERMODYNAMIC PROPERTIES OF SODIUM VAPOR; by T. H. Inatomi and A. Benton. Issued Oct. 8, 1951. 36p. (NAA-SR-141)

The calculated free-energy functions, the enthalpy functions, the entropies, and the specific heats for both the monatomic and diatomic sodium vapor, and entropies, enthalpies, and equilibrium constants for equilibrium mixtures of the two species, are tabulated for the temperature range 100 to 2600°K. These values were obtained for a pressure of 1 atm by the methods of statistical mechanics, assuming the vapors to be ideal gases.

6756
National Bureau of Standards
A CRYOSCOPIC STUDY OF THE SOLUBILITY OF URANIUM IN LIQUID SODIUM AT 97.8°C; by Thomas B. Douglas. Mar. 12, 1951. Decl. Oct. 16, 1951. 13p. (AECD-3254)

With an average reproducibility of approximately ±0.001°C, measurements were made of the equilibrium temperatures, at various stages of melting from 70 to 100% complete, of three samples of Na. One sample contained U in bulk form and one sample contained finely divided U. A Ag-core furnace was used to provide an environment of constant and uniform temperature. Impurities present in all the samples lowered the freezing point by 0.035°C. As compared with the Na containing no U, that containing finely divided U had a freezing point higher by 0.005°C, an effect attributed to a partial purification of the Na by the U. The Na containing bulk-form U was found, however, to have an average freezing point lower than without U by 0.001 to 0.003°C, corresponding to approximately 0.007% by weight of U in solution. It is concluded that if solubility equilibrium was obtained in these experiments, the solubility of U in liquid Na at 97.8°C does not exceed a few hundredths of 1% by weight, and may actually be many times smaller. (auth)

6757
Armour Research Foundation
RESEARCH ON THE ELEMENT SILICON AND SILICON ALLOYS; by W. R. Johnson and M. Hansen. June 1951. 133p. (AF-TR-6383)

A survey of the literature on the preparation and properties of Si is followed by a report of experimental studies of Si and its alloys. The covalent diamond-type crystal lattice of Si is stable up to at least 1317°C which is within 110° of its melting point. Si lacks any appreciable degree of ductility, although extremely slight deformation may occur, apparently exclusively by twinning, before cleavage takes place. Phase relationships in binary alloys of Si with the following elements have been studied metallographically: Al, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, Zr, Nb, Mo, Ag, Sn, Ta, and W. In most cases, the alloys consist of a mixture of Si and the disilicide of the alloying element. There appears to be no possibility of obtaining a ductile metallic lattice structure in a high-Si alloy, either by high-temperature allotropic transformation or by alloying.

6758
A STANDARD LABORATORY CORROSION TEST FOR METALS IN PHOSPHORIC-ACID SERVICE. H. F. Ebling

and M. A. Scheil. Trans. Am. Soc. Mech. Engrs. 73, 975-87(1951) Oct.

A standard laboratory-test procedure for corrosion in phosphoric acid is proposed, using c.p. 85% orthophosphoric acid. The specimen is put into cold acid; the acid is brought to a boil and held there for 24 hr. A formula is given for calculation of the corrosion rate. Test results were found to be reproducible within ±10% when good laboratory technique and equipment were used. No intergranular type of attack was observed on ELC type 316 and 317 alloys. Cu in the 316 alloy or in the solution was shown to be a powerful corrosion-inhibiting agent. Ag acted similarly but Cd and Sn did not. The relation between the laboratory test and field experience is presented and illustrated. A table of laboratory corrosion-test results is presented as a guide in selecting metals for phosphoric-acid service.

6759

LESS COMMON METALS. D. B. Broughton. Ind. Eng. Chem. 43, 2280-2(1951) Oct.

Literature published during the past year on methods of production, mechanical properties, and alloys of Ti and of Zr is reviewed. A few articles on Ta, Mo, and the noble metals are also surveyed. 51 references.

6760

PRODUCTION OF DUCTILE VANADIUM BY CALCIUM REDUCTION OF VANADIUM TRIOXIDE. E. D. Gregory and W. C. Lilliendahl. J. Electrochem. Soc. 98, 395-9 (1951) Oct.

Calculations were made to determine the heat of reaction of calcium with different oxides of vanadium. These calculations indicated better means of controlling the reaction. Ductile rod, wire, and sheet were fabricated from a powder produced by calcium reduction of V_2O_3. Fabrication furnished some information on working and annealing while other studies yielded physical property, purity, and microstructure data. (auth)

6761

SYSTEMS TITANIUM-MOLYBDENUM AND TITANIUM-COLUMBIUM. M. Hansen, E. L. Kamen, H. D. Kessler, and D. J. McPherson. J. Metals (N.Y.) 3, 881-8(1951) Oct.

The highly reactive Ti-Mo and Ti-Nb alloys were prepared and heat treated under protective conditions. Phase diagrams were established based on micrographic and X-ray diffraction analysis and detection of incipient melting. β titanium forms a continuous series of solid solutions with both Mo and Nb, whereas these metals are only slightly soluble in the α titanium modification. (auth)

6762

THE VAPOR PRESSURES OF INORGANIC SUBSTANCES. VI. VANADIUM BETWEEN 1666°K. AND 1882°K. James W. Edwards, Herrick L. Johnston and Paul E. Blackburn. J. Am. Chem. Soc. 73, 4727-9(1951) Oct. (See also NSA 5-2799)

The vapor pressure of vanadium was determined over the temperature range 1666° to 1882°K. by measuring the rate at which a metal surface evaporates into a vacuum. Values of ΔH_0° were calculated from individual vapor pressures and showed no appreciable trend, the average value being 121.95 ± 0.14 kcal. By combining this value with a linear expression in T for the difference in free energy functions between solid and gaseous vanadium, the following vapor pressure equation was obtained: $R \ln p = \frac{-121.95 \times 10^3}{T} - 5.123 \times 10^{-4} T + 36.29$. (auth)

6763

LOW TEMPERATURE HEAT CAPACITIES OF INORGANIC SOLIDS. VIII. HEAT CAPACITY OF ZIRCONIUM FROM 14 to 300°K. Gordon B. Skinner and Herrick L. Johnston. J. Am. Chem. Soc. 73, 4549-50(1951) Oct.

The heat capacities of hafnium-free zirconium have been measured in the temperature range 14 to 300°K., and the derived thermal functions have been calculated and tabulated at integral values of the temperature over this range. The entropy at 298.16°K. is 9.29 ± 0.04 e.u. (auth)

6764

THE PREPARATION OF THE HYDRIDES OF ZINC, CADMIUM, BERYLLIUM, MAGNESIUM, AND LITHIUM BY THE USE OF LITHIUM ALUMINUM HYDRIDE. Glenn D. Barbaras, Clyde Dillard, A. E. Finholt, Thomas Wartik, K. E. Wilzbach and H. I. Schlesinger. J. Am. Chem. Soc. 73, 4585-90(1951) Oct.

The preparation of the hydrides of zinc, cadmium, beryllium, and magnesium by the interaction of the corresponding metal alkyls with lithium aluminum hydride in ethyl ether solutions is reported. The use of dimethyl aluminum hydride in place of the lithium salt in some instances is also described. The zinc and cadmium hydrides were obtained in pure condition; from beryllium and magnesium hydrides not all of the solvent could be removed. Indications of the existence of alkyl metal hydrides were observed, and zinc borohydride was prepared for the first time. The new substances are described, but detailed discussion of the reactions is deferred to a later paper. (auth)

6765

EFFECT OF RATE OF COOLING ON THE ALPHA-BETA TRANSFORMATION IN TITANIUM AND TITANIUM-MOLYBDENUM ALLOYS. Pol Duwez. J. Metals (N.Y.) 3, 765-71(1951) Sept.

The effect of the rate of cooling on Ti, Zr, and Tl has been measured. The temperature at which Ti transforms from the β form to the room-temperature α form decreases progressively from 882 to about 850°C with increasing rate of cooling from 4 to 10,000°C/sec. A similar effect has been found for Zr for which the drop in temperature is from 865 to 850°C. The transformation temperature of Tl is not affected by rates of cooling up to 8000°C/sec. The solid-state phase boundaries in the Ti-Mo system have been established above 650°C. Alloys quenched from the β field transform into an α supersaturated solid solution (called α') for Mo concentration up to about 12%. The transformation is only partial from about 4 to 12% Mo. Above 12% Mo, the β structure is retained. From 0 to 8% Mo, the temperature at which β transforms entirely or partially to α' was measured by thermal analysis. This temperature is not affected by the rate of cooling. For Mo concentration between 8 and 12%, no heat effect was detected during cooling although it was found by both x-ray diffraction and microscopy that α' was present after quenching.

6766

ATOMIC ARRANGEMENTS IN GOLD-NICKEL SOLID SOLUTIONS. P. A. Flinn and B. L. Averbach. Phys. Rev. 83, 1070(1951) Sept. 1 (Letter to the editor)

Measurements of diffuse x-ray scattering from Ni-Au solid solutions have been made by both photographic and Geiger-counter spectrometer techniques. The general form of the observed scattering curve does not change on quenching and is similar for all of the compositions studied from 10 to 90% Au. A microphotometer trace of a typical diffraction photograph is shown. The diffuse scattering for Ni_3Au_2 differs considerably from that predicted by the clustering hypothesis since there is no evidence of small-angle scattering. On the other hand, the intensity distribution does not fit the form required for short-range order of the Cu_3Au type. The results indicate that there is no clustering of like atoms in these solid solutions.

6767

ON THE RELATION BETWEEN THE NATURE AND SENSITIVITY TO CORROSION OF THE GRAIN JOINTS IN

ALUMINUM–7% MAGNESIUM SOLID SOLUTION. Pierre-A. Jacquet. Compt. rend. 233, 621-3(1951) Sept. 10. (In French)

Electron microscope studies show morphologic differences between the phases which separate on the grain surfaces from an Al-7% Mg solid solution on annealing at 160 and 250°C. Only the 160°C treatment sensitizes the alloy to intergranular corrosion. The corrosion (anodic in NaCl solution) does not seem to attack the separating component itself but rather the surrounding matrix. The phase formed at 250°C is corroded integrally with the grains. 6 figures.

6768

THE INFLUENCE OF A SMALL AMOUNT OF COLD-WORKING ON THE KINETICS OF HARDENING OF SOLID SOLUTIONS OF ALUMINUM. Aurel Berghezan. Compt. rend. 232, 1560-2(1951) Apr. 23. (In French)

An abstract of this paper appeared in Chem. Abstracts 45, 7934i(1951) Sept. 25 and is reproduced here in its entirety.

Rough-tempered samples of 4% Cu in Al and 8% Zn in Al were pulled to 3, 6, and 10% and were aged at various temperatures between 20 and 150°C. Microhardness measurements and the persistence of the Portevin-Le Chatelier phenomenon showed that further hardening in these samples was strongly retarded as compared to samples normally aged at 20°C. This inhibition was also obtained by simple bending of a cold sample immediately after quenching or of a hot sample just before quenching. Micrographs of samples tempered by water quenching and by cold working showed a large difference, the lines of deformation being persistent to electrolytic polishing in the former case. It was concluded that there is probably a threshold of cold working at which acceleration of the rate of hardening begins.

6769

SURFACE TENSION OF LIQUID METALS. N. R. Mukherjee. J. Applied Phys. 22, 1215-16(1951) Sept. (Letter to the editor)

The surface tension of liquid metals at the melting point was found to be approximately proportional to their molar latent heat of fusion. The empirical relation obtained from this study is $\sigma = 365\ Q_f$ where σ is the surface tension in dynes/cm and Q_f is the molar latent heat of fusion in kilocal/gram atom.

6770

THE PHYSICAL AND METALLURGICAL CHARACTERISTICS OF SPOT-WELDED TITANIUM. M. L. Begeman, F. W. McBee, Jr., and J. C. Fontana. Welding J. (N.Y.) 30, 429-34(1951) Sept.

The properties and problems of spot welding commercially pure Ti are reported. Optimum current timing and pressure for spot welding are given.

6771

CREEP AND STRESS RUPTURE BEHAVIOR OF ALUMINUM AS A FUNCTION OF PURITY. Italo S. Servi and Nicholas J. Grant. J. Metals (N.Y.) 3, 909-16(1951) Oct.

Extensive data of minimum creep rates and rupture times for high purity and commercial Al confirm the existence of a transition range from the low temperature-type to the high temperature-type behavior. The data are analyzed in line with the suggested theories of deformation of metals. (auth)

6772

OXIDATION OF TITANIUM. M. H. Davies and C. E. Birchenall. J. Metals (N.Y.) 3, 877-80(1951) Oct.

The rate of oxidation of titanium in the temperature range 650 to 950°C has been measured. The linear rate law obtained is explained by interface reaction control of the process. Tracer experiments indicate the oxygen diffuses in at least one phase of the scale. (auth)

MINERALS AND MINERALOGY

6773

Geological Survey

FORTY-NINER, KING SOLOMON RIDGE, AND WEST END CLAIMS NEAR CLANCY, JEFFERSON COUNTY, MONTANA; by M. R. Klepper. Aug. 1950. 5p. (TEM-31)

The Forty-Niner, King Solomon Ridge and West End claims are located on the crest of an east-trending ridge on the north side of Clancy Creek west of Clancy, Jefferson County, Mont. The radioactivity is concentrated in and adjacent to dark-gray siliceous and slightly pyritic veins that cut the aplitic granite which composes the crest of the ridge. Selected pieces of the vein material were analyzed and found to contain 0.096% U.

6774

Geological Survey

PROGRESS REPORT; WAMSUTTER (RED DESERT) AREA, WYOMING. [nd] 2p. (TEM-96A)

Results of field work in the Red Desert area include (1) determination that the Lost Creek schroeckingerite deposit occurs in a fault zone that has been traced for more than 25 miles, (2) mapping of two radioactive lignite-clay beds over a length of 9 miles, and (3) information bearing on origin and possible extensions of known deposits.

6775

Division of Raw Materials, AEC

PRELIMINARY REPORT ON SOME URANIUM DEPOSITS ALONG THE WEST SIDE OF THE SAN RAFAEL SWELL, EMERY COUNTY, UTAH; by Millard L. Reyner. Oct. 1950. 29p. (RMO-673)

Twelve U-bearing deposits have been examined along 30 miles of the western border of the San Rafael Swell in Emery County, Utah. All of the U-bearing deposits examined are in the Shinarump conglomerate, near its base. The bulk of the U is present in intimate association with asphalt. Very little carnotite is present. The V content in general increases from almost nil in the northern part of the area to a ratio of about 1:1 with U in the southern part. Ag is distributed fairly uniformly throughout the ore horizon of the area.

6776

Division of Raw Materials, AEC

RECONNAISSANCE OF CERTAIN URANIUM DEPOSITS IN ARIZONA; by Robert J. Wright. Dec. 1950. 20p. (RMO-679)

Seventeen U-bearing mineral deposits in Cochise, Gila, Graham, Mohave, Pima, Pinal, Santa Cruz, and Yavapai Counties in Arizona were investigated. Four general types of deposits were found: (1) vein deposits with associated base and precious metals, (2) vein deposits in granite with minor metallic metals, (3) deposits in sedimentary rocks near instrusive contacts, and (4) deposits within broad shear zones in volcanic rocks.

6777

Division of Raw Materials, AEC

RECONNAISSANCE OF BASIN-BOULDER-CLANCEY AREA, JEFFERSON COUNTY, MONTANA; by Millard L. Reyner. 1950. 13p. (RMO-674)

About 30 mines and prospects in Jefferson County, Mont., were visited and observations at those deposits which appeared to possess a significant degree of radioactivity are summarized. Extent of development, types of minerals present, and amount of radioactivity are discussed briefly for each of 15 deposits.

6778

Division of Raw Materials, AEC

RECONNAISSANCE OF HENRY MOUNTAINS AREA;

WAYNE AND GARFIELD COUNTIES, UTAH; by E. V. Reinhardt. Apr. 5, 1951. 9p. map. (RMO-753)

Observations were made on stratigraphy, regional geology, and the locations of known deposits of U and V in the Henry Mountains area of Utah. Three orebodies have been opened in the North Wash district of this area. The ore varies in thickness from a few inches to 1.5 ft where it has been mined and is of good grade. An ore body 2 ft thick and of excellent grade is being worked on Farmer's Knob in the Trachyte district. Other ore deposits are located in Shootering Canyon in the Little Rockies district.

6779

Columbia Univ.

ANNUAL REPORT FOR JULY 1, 1950, TO JUNE 30, 1951; by Paul F. Kerr, T. P. Anderson, C. A. Rasor, R. J. Pill, P. K. Hamilton, H. Wright, and W. J. Cohen. Issued Sept. 1951. 90p. 19 figs. 4 tables. 2 plates. (RMO-797)

An x-ray fluorescence unit for U, Fe, and Pb is described, and analytical data on a fine-grained mixed uraninite sample from Marysvale, Utah, are presented. The U-bearing minerals present, the wall rock alteration, possible origin of the minerals, and the mining being done are discussed for the following locations: the Prospector Mine near Marysvale, Utah; the Black King prospect near Placerville in San Miguel County, Colo.; Bellevue-Rochester Mine near Lawson along Clear Creek upstream from Idaho Springs, Colo.; the Silver Bell shaft, Free Enterprise property, Boulder, Mont.; the W. Wilson adit in the President group of claims near Alhambra, Jefferson County, Mont.; the Caribou Mine, Colo.; the Theano Point area along the east shore of Lake Superior in Ontario.

6780

Division of Raw Materials, AEC

HAPPY JACK MINE, WHITE CANYON, UTAH; by Philip H. Dodd. Dec. 1950. 25p. (RMO-660)

The Happy Jack Mine is located on the south rim of White Canyon in San Juan County, southeastern Utah. The geology of the region and the structure, mineralogy, and genesis of the Happy Jack U deposit are discussed.

6781

Division of Raw Materials, AEC

ANNIE LAURIE PROSPECT, SANTA CRUZ COUNTY, ARIZONA; by Robert J. Wright. Jan. 1951. 9p. (RMO-677)

Pitchblende occurs within sheared and mineralized porphyritic flow rock at the Annie Laurie prospect near Ruby, Ariz. Accompanying minerals include sphalerite, pyrite, galena, chalcopyrite, and fluorite in a carbonate gangue. The area of U mineralization has been outlined by sampling based upon a radiometric survey. (auth)

6782

Division of Raw Materials, AEC

RECONNAISSANCE EXAMINATIONS OF COPPER-URANIUM DEPOSITS WEST OF THE COLORADO RIVER; by Donald L. Everhart. Nov. 1950. 17p. (RMO-659)

Several relatively small Cu-U deposits have been found in southwestern Utah along the contact of the Shinarump and Moenkopi formations of Triassic age, at least from the San Rafael Swell area of Emery County, southward through central and eastern Garfield County, and Wayne County, southwestward into western Kane County, and westward into the southern part of Washington County. They also extend southward into northern Arizona. These deposits are highly localized and spotty in nature and, at present, seem somewhat discontinuous in their distribution. Exploration and prospecting of these deposits has only begun, owing largely to the inaccessibility of the favorable areas. A few of the deposits contain very local concentrations of material assaying upward to 1% or more U_3O_8, but channel and bulk sampling in the Escalante area of Garfield County, at least, indicate that mineable quantities of ore exposed at the surface in this area are limited in amount.

6783

Geological Survey

PROGRESS REPORT; COLORADO FRONT RANGE AREA. [nd] 2p. (TEM-97A)

Radiometric testing of surface and underground workings, detailed geologic mapping of selected small areas of surface and underground workings, and sampling of radioactive areas were carried out on all known radioactive deposits from Prairie Divide, Larimer County to Canon City, Fremont County, Colo. Vein deposits of pitchblende in the area between Jamestown, Boulder County, and Idaho Springs, Clear Creek County, are small and probably cannot be worked profitably at present prices. General conclusions concerning the occurrence of pitchblende are listed.

6784

Division of Raw Materials, Exploration Branch, AEC

FREE ENTERPRISE URANIUM PROSPECT, JEFFERSON COUNTY, MONTANTA; by Ernest E. Thurlow and Millard E. Reyner. Apr. 1950. 13p. (RMO-678)

The Free Enterprise property is located in the Boulder mining district, Jefferson County, Mont. Secondary U minerals occur here in small irregular concentrations in and adjacent to a narrow silicified fracture zone in quartz monzonite. The zone has been prospected to a depth of 150 ft. Small amounts of a black to brownish U mineral, presumably pitchblende, have been observed, and the secondary minerals are characteristic of the alteration of pitchblende and uraninite. Indications are that a primary U mineral which was introduced with quartz and sulfides has been reconstituted by the action of surface and near surface waters, reprecipitating U in secondary minerals. Below the present water level, where the vein is relatively unaltered and unenriched, only small amounts of U are present. (auth)

6785

Division of Raw Materials, AEC

GEOLOGY AND ORE DEPOSITS OF MESA V, LUKACHUKAI DISTRICT, ARIZONA; by John W. King. [nd] 15p. (RMO-754)

The Lukachukai area lies in Apache County, Ariz., approximately 10 miles west of the Arizona-New Mexico state line at Red Rock, Ariz.; it is about 30 miles south of the Utah-Arizona state line, and wholly within the Navajo Indian Reservation. The Salt Wash of Mesa V contains U ore outcrops which indicate favorable intensity of mineralization at one horizon along a 2000-ft outcrop interval. Other scattered exposures indicate the existence of ore under much of the mesa surface. Two trends of ore, one at 90° to the other, appear to exist. Excellent ore showings crop out on Mesa Four-and-a-half. Stratigraphy, ore associations and deposits, and exposures are described in detail.

6786

Division of Raw Materials, AEC

RECONNAISSANCE OF RED ROCK DISTRICT, COVE MESA, AND KINUSTA (TREE) MESA, ARIZONA; by John W. King. Feb. 1, 1951. 13p. (RMO-755)

Red Rock district, Cove mesa, and Kinusta mesa lie in the southern Carrizo Mountain region of Apache County, Ariz., 25 miles south of the Utah State line. The Red Rock district lies along the Arizona-New Mexico line, and the two mesas are approximately 15 miles to the west. These areas are within the boundaries of Navajo reservations. All known U and V ore deposits in the Carrizo Mountain area are in the lower part of the Salt Wash member of the Morrison formation. Location and access to these areas, claim locations and ownership, geological features, and mineralization are discussed.

6787
California Department of Natural Resources
GEM- AND LITHIUM-BEARING PEGMATITES OF THE PALA DISTRICT, SAN DIEGO, CALIFORNIA (Special Report No. 7-A); by Richard H. Jahns and Lauren A. Wright. June 1951. 80p. (maps) (NP-3378)

Lithium-bearing pegmatites are found in the Pala district in northwestern San Diego County, California. The pegmatites occur mainly in gabbroic rocks, and appear to have been emplaced along a well-developed set of fractures. Graphic granite is the chief constituent of the outermost units or border zones. Discoidal masses of coarse-grained pegmatite form the innermost zones or cores. The commercial concentrations of lepidolite occur in so-called "pocket pegmatite," mineral aggregates at least partly of replacement origin. These deposits were actively mined from 1900 to 1922, but future activity will depend upon discovery of additional concentrations which are not exposed at the surface.

6788
STUDIES OF URANIUM MINERALS(VIII): SABUGALITE, AN ALUMINUM-AUTUNITE. Clifford Frondel. Am. Mineral. 36, 671-9(1951) Sept.-Oct.

Sabugalite is a new member of the autunite group with the composition $HAl(UO_2)_4(PO_4)_4 \cdot 16H_2O$. Analyses are cited of material from the Mina da Quarta Seira, Sabugal, Beira province, and from Kariz, Minho province, in Portugal; a third occurrence is noted from Bendada in Beira province. Sabugalite is a secondary mineral found associated with meta-autunite, saléeite, and phosphuranylite. It occurs as crusts of yellow platy crystals with perfect cleavage (001). Hardness 2½; gravity 3.20. Air-dried sabugalite optically has an anomalous biaxial negative character with nX = 1.564 to 1.565 (colorless), nY = 1.581 to 1.583 (yellow), nZ = 1.582 to 1.584 (yellow), and 2V = 0° to moderate. X-ray study indicates a tetragonal cell with a_0 = 6.96 A, c_0 = 19.3; $a_0 : c_0$ = 1 : 2.773; cell contents $HAl(UO_2)_4(PO_4)_4 \cdot 16H_2O$. Sabugalite is isostructural with fully-hydrated autunite $Ca_2(UO_2)_4(PO_4)_4 \cdot 16H_2O$, with $Al^{+3} + H^+ = 2Ca^{++}$. Sabugalite breaks down between 68 and 101° to a new phase isostructural with the artificial meta-II hydrate of autunite and does not form an intermediate meta-I hydrate with halved cell contents as does fully-hydrated autunite. The water content of the fully-hydrated and meta-II hydrates of sabugalite varies zeolitically with accompanying variation in the indices of refraction. (auth)

6789
STUDIES OF URANIUM MINERALS(IX): SALÉEITE AND NOVACEKITE. Clifford Frondel. Am. Mineral. 36, 680-6 (1951) Sept.-Oct.

Novacekite, a new uranium mineral from Schneeberg, Saxony, has the composition $Mg(UO_2)_2(AsO_4)_2 \cdot nH_2O$ and forms a probably complete series to the phosphate analogue, saléeite. Analyzed material with As:P ~1:1 is tetragonal with a_0 = 7.12 A, c_0 = 20.14 and gravity 3.3. Optically this material, like the other members of the series, has an anomalous biaxial negative character, with nY = nZ = 1.620 to 1.623 and 2V 0° to 15°. The unanalyzed but essentially pure end-component, also from Schneeberg, has a_0 = 7.16 A, c_0 = 20.19; biaxial negative with nX = 1.620, nY = nZ = 1.637, 2V 0° to 15°; gravity 3.6. An analysis is given of a new occurrence of saleeite, $Mg(UO_2)_2(PO_4)_2 \cdot nH_2O$, at Mina da Quarta Seira, Sabugal, Portugal; tetragonal with a_0 = 7.01 A, c_0 = 19.84; biaxial negative with nX = 1.565, nY = 1.582, nZ = 1.585, 2V ~ 65°, r > v. Saléeite from Shinkolobwe, Belgian Congo, has a_0 = 7.02 A, c_0 = 19.81; nX = 1.554, nY = nZ = 1.571, 2V 0 to 10°. Novacekite and saléeite closely resemble and are isostructural with fully-hydrated autunite. The indices of refraction vary with the content of zeolitic water within the limits of stability of the fully-hydrated phase. (auth)

6790
THE CHEMICAL ELEMENTS IN OCEAN WATER. R. Legendre. Scientia (Milan) (6) 86, No. 8-9, 221-7(1951). (In French)

Concentrations of the elements and ions in the ocean are listed; that of U is given as 0.002 mg/kg or 0.000008 millimole/kg of ocean water.

6791
RARE METALS IN THE ARGENTINE REPUBLIC. Gustavo A. Fester. Industria y quimica 13, 69-71(1951) May (In Spanish)

The rare-metal situation in Argentina is summarized. The metals included are W, Bi, Be, Ta, Nb, Li, U, Mo, V, Co, Cd, and Ti. The topics discussed include location of mineral deposits, methods and extent of purification, year and amount of past maximum production, and present status of production.

PHYSICS

6792
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
PROGRESS REPORT; AUGUST 31, 1951. 98p. (NP-3391)

Separate abstracts have been prepared on the following sections of this report: Chemistry of the Fission Elements Group and Cosmic Ray Group, p.1-14; Elementary Particle Scattering Group and Generator Construction and High Voltage Research Group, p.15-27; Nuclear Chemistry (Inorganic) Group, p.29-44; Nuclear Chemistry (Organic) Group, p.46-48; Nuclear Cross Sections Group, p.49-71; and Radioactivity and Cyclotron, Synchrotron, and Theoretical Groups, p.72-95.

6793
Ames Lab.
WHEATSTONE BRIDGE TEMPERATURE COMPENSATION; by William C. Shaw. Aug. 20, 1951. 3p. (AECU-1668)

COSMIC RADIATION

6794
PENETRATING BURSTS OF COSMIC RADIATION. E. P. George and P. T. Trent. Proc. Phys. Soc. (London) 64A, 733-45(1951) Aug. 1.

Bursts of cosmic radiation, accompanied by the discharge of one or more of 18 surrounding Geiger counters separated from it by 15 cm Pb, have been studied at Jungfraujoch, Switzerland (altitude 3,457 m), at sea level, and below ground at a depth equivalent to 60 m water. Bursts at Jungfraujoch were separated into those associated with air showers (accompanied bursts), and local bursts. The accompanied penetrating bursts appear to be associated with the incidence of high density regions of air showers. The local penetrating burst size increases with the number of penetrating particles recorded consistent with their interpretation in terms of mixed showers involving the simultaneous production of

charged and neutral mesons in energetic nuclear collisions of the N-component. Underground about 10% of the bursts under 15 cm Pb are of the mixed shower type. These underground bursts are attributed to nuclear excitations produced by fast μ mesons, resulting again in charged and neutral meson emission. About one-third of the bursts observed below ground with no Pb over the chamber appear to be produced by single penetrating particles which release, by an unidentified process, 20 Mev and more in the ion chamber.

6795

ON THE DISTRIBUTION OF VARIOUS RADIATIONS IN AUGER SHOWERS. Guy Carmouze and Jean Daudin. Compt. rend. 232, 2018-20(1951) May 28. (In French)

Conclusions drawn from a study of Rossi showers originating in Pb at 2860-m altitude (Compt. rend. 231, 572(1950); NSA 5-638) have been changed by noting that increasing the surface covered by coincidence counters increased (in logarithmic proportion) the number of "associated" local showers. No evidence exists that any of the events from Pb are independent of the air showers, and the barometric coefficient of these events is very close to that for air showers. The words "air showers" in the preceding note should be replaced by "dense-air showers." Results of varying the counter area at 560-m altitude are given, and applications of this method to nuclear and electromagnetic components are discussed.

6796

ON THE DECAY OF NEUTRAL V-PARTICLES. R. B. Leighton, S. Dean Wanlass, and William L. Alford. Phys. Rev. 83, 843-5(1951) Aug. 15. (Letter to the editor)

Several new examples of the decay of neutral V-particles have been obtained at Pasadena. The momentum and estimated specific ionization and the computed mass values of the charged secondaries in 9 examples are tabulated. All of the negative particles are mesons; most of the positive particles are much heavier than mesons. The present results, and those of other observers, are consistent with the assumption that several different V° particles exist, all of comparable lifetime, one or more of which decays into the mesons, and two or more into a proton and meson, the latter with energy releases of ~32 Mev and ~55 Mev. However, all of the results obtained can also be explained in terms of a single three-body decay process having a fixed Q-value, in which a neutral V-particle always decays into two mesons and a nucleon, thus: V° → meson + meson + nucleon + Q, where the distribution of charge between the nucleon and the mesons is such that any of the three particles is about equally likely to be neutral. A histogram of energies released for the cases of π + p decay is shown. If the three-body decay scheme is correct, the Q value should be in the range 100 to 150 Mev.

6797

ON THE ISOLATED TRACKS PRODUCED BY COSMIC RAYS IN NUCLEAR EMULSIONS. Hassan Moucharrafieh and Simone Rebaud. J. phys. radium 12, 527-34(1951) Apr. (In French)

Geometrical considerations are used to evaluate the direction intensity of isolated tracks, i.e., not originating in the emulsion, in nuclear emulsions exposed at various latitudes. A ratio of 9 tracks of mesons to 100 of other particles of unit charge was found for tracks terminating in the emulsion; an evaluation of the energy spectrum of the tracks leads to an upper limit of 5 to 100 for all visible tracks. The results are compared with observations of a C3 + B emulsion exposed near the equator at 4500-m altitude. The East-West dissymmetry observed for isolated tracks in emulsions is not the same as that observed by means of counters. The nature of these tracks is discussed.

6798

ANGULAR DISTRIBUTION OF FRAGMENTS OF DIFFERENT CHARGE EMITTED IN COSMIC-RAY NUCLEAR EXPLOSIONS. Jean Crussard. Compt. rend. 233, 611-13(1951) Sept. 10. (In French)

Ilford G5 emulsions were exposed in balloon flights at 20,000 to 30,000 m. A total of 134 fragments with Z between 3 and 8 were observed in stars of at least seven branches produced by incident particles of unit charge at minimum ionization. Their angles of emission have been compared with those of protons and α particles. A marked preference for emission at less than 90° to the prolongation of the primary is exhibited by the heavy fragments, even at low energies.

6799

OBSERVATIONS OF THE LATITUDE EFFECT OF PENETRATING SHOWERS. J. W. Sturgess. Proc. Phys. Soc. (London) 64A, 745-50(1951) Aug.

The latitude effect of the local penetrating showers of cosmic radiation produced in paraffin has been measured at sea level and found to be in the ratio of 1.8 ± 0.4 between London and Dakar, French West Africa. The extensive penetrating showers showed no latitude effect, which is consistent with the greater energy of these showers. The background frequency of local showers, i.e., those recorded with no absorber above the counter system, was found to be insensitive to latitude and reasons for this are discussed. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

6800

THE CRYSTAL STRUCTURE OF THE β PHASE OF URANIUM. Charles W. Tucker, Jr. Acta. Cryst. 4, 425-31(1951) Sept.

The crystal structure of the β phase of metallic U (stable between 660 and 760°C) was deduced from x-ray diffraction measurements made on single crystals of the phase retained in an alloy containing 1.4 at. % Cr and rapidly cooled from 720°C. Diffraction data and other measurements are given.

GASES

6801

THE HEAT EFFECT OF DIFFUSION. J. E. Verschaffelt. Bull. classe sci. Acad. roy. Belg. 37, 307-23(1951). (In French)

The heat effect of diffusion is calculated for the kinetics of gaseous molecules. Discrepancies between the author's theory (ibid. 35, 869-79(1949)) and Waldmann's calculations (Z. Physik 123, 28-50(1944); 124, 175-95(1948)) are explained as due to the introduction by Waldmann of a factor for heat flow by conduction which in reality is an energy flow by convection.

INSTRUMENTS

6802

Atomic Energy Research Establishment, Harwell, Berks (England)

A DRY BOX FOR α, β, γ WORK; by G. B. Cook and F. Morgan. June 11, 1951. 6p. (AERE-C/R-724)

A dry box has been designed and constructed to afford protection against α-active dust and intense β and γ activities. The box used at Harwell was designed to fit into the existing fume cupboards. It is built largely of wood with the front and the front parts of the right-hand wall and top made of perspex. The over-all dimensions are 70 by 70 by 70 cm with a well in the base to accommodate a centrifuge. Protection is provided by a lead brick wall, supported on the floor of the fume cupboard, covering the entire front face.

A lead-glass brick allows direct vision into the box. Remote handling through the wall is possible using tongs. The box is ventilated by suction from an electric motor and fan through a Porton-type filter set at the back of the top surface. The effluent gases are led by a pipe to the normal ventilation ducts. In operation, the box was found adequate for relatively small jobs. Several suggestions are made from experience for improvements.

6803

Los Alamos Scientific Lab.

A NEW LOW-IMPEDANCE HIGH VACUUM VALVE; by John S. Wahl, Stuart G. Forbes, Warren E. Nyer, and R. N. Little. [nd] 4p. (AECU-1655; LADC-1025)

A vacuum valve is described in which the vacuum seal is obtained by sliding a flat vane across an O-ring. The use of an O-ring one size smaller in outside diameter than that for which the groove was designed prevents its being pushed out of the groove. No leak could be detected, at 500 psi, with an ionization gauge. The He through-leak rate was no greater at 500 psi than at atmospheric pressure.

6804

Columbia Univ.

A SEMI-AUTOMATIC DEVICE FOR ANALYZING EVENTS IN NUCLEAR EMULSIONS; by Marietta Blau, Robert Rudin, and Seymour Lindenbaum. May 19, 1950. 20p. (CUD-52; DR-1404)

6805

Atomic Energy Research Establishment, Harwell, Berks (England)

REMOTE HANDLING DEVICES PRODUCED AT A.E.R.E; by P. Boddington. Mar. 1950. 32p. (AERE-E/M-30)

6806

Fordham Univ.

MERCURY CONTACT FOR CONSTANT TEMPERATURE THERMOREGULATOR; by Michael Cefola and Arthur J. Chadwick. Sept. 1, 1951. 7p. (NYO-722)

6807

INTENSE GALLIUM X-RAYS FOR MICRORADIOGRAPHY AND DIFFRACTION INVESTIGATIONS. C. F. Bruce. Nature 168, 471-2(1951) Sept. 15.

The only radiation capable of discriminating between Cu and Zn-rich segregates in brass is the K α radiation of Ga lying between their two K absorption edges. This radiation heretofore has not been available on account of the Ga low melting point (29.75°C). The method of obtaining this radiation is described. A thin uniform layer of Ga is rubbed on the rotating anode of a Gyrotron x-ray tube. During the emission of x rays the Ga at the focal spot is liquid but instantly freezes on moving away from the electron stream.

6808

A CATHODE-TYPE ARC-ION SOURCE. E. H. Beach and W. C. Parkinson. Rev. Sci. Instruments 22, 697-9(1951) Sept. (Laboratory and shop note)

A heater-type cathode has been designed with increased life expectancy compared with that of the standard filament-type ion source. The heating filament, which surrounds the cathode, takes the arc at the start. The arc is transferred to the cathode by means of a switch when the cathode is sufficiently heated. A cross sectional view of the ion source and a schematic diagram of the arc circuit are given.

6809

DESIGN OF AN AUTOMATIC TRAJECTORY TRACER. Jean Salmon. J. phys. radium 12, 694-5(1951) June. (Letter to the editor; in French)

A probe and servomechanism designed to trace automatically the trajectory of a charged particle in a system of electrodes at constant potentials is proposed, and a circuit is outlined.

6810

A RECORDING WARBURG APPARATUS. William Arnold, E. W. Burdette, and J. B. Davidson. Science 114, 364-7 (1951) Oct. 5 (Technical paper)

The manometers in a standard Warburg apparatus were replaced by pressure transducers which were mounted on the tops of the old manometer backs and connected to the vessels just as were the regular manometers. The strain gage bridge circuit was coupled into a transmitter and controller which is diagramed. The Brown-recorder chart of an experiment in photosynthesis is presented.

6811

A SIMPLE INSTRUMENT FOR THE DETERMINATION OF ACH. J. B. Davidson. Science 114, 361-2(1951) Oct. 5. (Technical paper)

In the use of the contraction of the rectus abdominus muscle of the frog for the determination of acetyl choline (Gerald, Methods in Medical Research Vol. 3, Chicago, Year Book Pub., 1950), the simple instrument described here eliminates the traditional smoked-drum kymograph and in its place uses a lightweight cantilever beam equipped with resistance wire strain gages in a bridge circuit. The output of the bridge is recorded on a Brown strip chart recorder. One end of the frog muscle is fastened to a hook in the bottom of a 15-ml bath of eserinized amphibian Locke solution, and the other end is fastened by means of a silk thread to the end of the beam. When a solution is to be tested the Locke solution is drained and replaced by the unknown.

ISOTOPE SEPARATION

6812

SEPARATION OF THE STABLE ISOTOPE OF SULFUR 34. Edward D. North and Robert R. White. Ind. Eng. Chem. 43, 2390-7(1951) Oct.

A supply of S^{34} has been obtained by means of a chemical-exchange reaction occurring in a packed column. Gaseous sulfur dioxide containing the naturally occurring abundance of S^{34} was brought into equilibrium with a solution of sodium bisulfite containing the natural abundance of S^{34}, and there was an exchange of $S^{34}O_2$ molecules between the two phases in such a way that the S^{34} concentration of the solution was slightly greater than the S^{34} concentration in the gas. The performance of ¼-in. Raschig rings in a column 2 in. in diameter and 63 ft high was correlated as values of height of equivalent theoretical plate plotted as a function of temperature, pressure, and flow rate. The separation factor was determined. Increasing the temperature up to 50°C was shown to have a beneficial effect on the separation process. The data on unsteady-state operation of the column indicate that the mass-transfer resistance controlled the rate of enrichment of S^{34}.

6813

THE SEPARATION OF ISOTOPES BY FRACTIONAL DISTILLATION. I. Dostrovsky, J. Gillis, and D. R. Llewellyn. Bull. Research Council Israel 1, 120-1(1951) Mar. (Letter to the editor)

A mathematical study of the process of isotope separation in a packed column has been made. The isotope concentrations in the liquid and the vapor at any point in the column are functions of the distance from one end of the column and of the time. These functions satisfy certain partial differential equations which have been solved for two specific cases.

6814

THE ISOTOPIC CHANGES OCCURRING ON THE FRACTIONATION OF METHANOL. I. Dostrovsky, E. D. Hughes,

and D. R. Llewellyn. Bull. Research Council Israel 1, 133(1951) Mar. (Letter to the editor)

Methanol of varying isotopic composition was subjected to fractional distillation. When an approximate equilibrium had been reached, it was found that no change in isotopic composition of carbon or hydrogen of the methyl group had occurred, whereas the oxygen and hydrogen of the hydroxyl group were both enriched in the liquid phase with respect to their heavy isotopes, oxygen by a factor of 2, hydrogen by a factor of 16.

6815

SEPARATION OF STABLE ISOTOPES BY ELECTROMAGNETIC MEANS. W. D. Allen. Nature 168, 451-3(1951) Sept. 15.

A survey is made of the electromagnetic separation of stable isotopes covering the historical development, a comparison with other methods, the degree of enhancement, and applications of separated isotopes. Brief mention is made of studies using separated isotopes in nuclear physics, spectroscopy, medicine, and superconductivity.

MASS SPECTROGRAPHY

6816

Brookhaven National Lab.

TIME-OF-FLIGHT MASS SPECTROMETER; by E. E. Hays, P. I. Richards, and S. A. Goudsmit. [nd] 3p. (AECU-1647)

A preliminary time-of-flight mass spectrometer has been built which has shown that time-of-flight methods offer particular advantages in precision measurements of heavy masses. The principle of the machine consists in measuring the period of the cyclotron resonance frequency for the ion in question. Ions from a pulsed ion source travel in a uniform magnetic field in spirals of various pitches and reach an electron-multiplier detector after various numbers of spiral turns. Comparison of the time difference between, for example, the second and eleventh spiral turns for several ions constitutes a relative mass measurement. The accuracy achieved with the present design has been in the range ±1 to 2 milli-mass-units. The spectrometer is briefly described without diagrams or photographs, and limitations on the present design are considered.

6817

MASS SPECTROMETRIC ANALYSIS OF DEUTERATED HYDROCARBONS. A. W. Tickner, W. A. Bryce, and F. P. Lossing. J. Am. Chem. Soc. 73, 5001-2(1951) Oct. (Note)

A method described by Stevenson and Wagner (J. Am. Chem. Soc. 72, 5612(1950)) for determining the amount of undeuterated paraffins present in monodeuteroparaffins was investigated as a general method of analysis of deuterated methanes. The results show that the method gives rise to serious errors when used for this purpose. The method involves the assumption that the appearance potentials of corresponding monodeuterated and undeuterated ions differ only owing to differences in zero-point energy which are estimated at 0.02 to 0.05 ev, whereas this investigation shows that the ionization potentials of the deuterated methanes differ considerably from one another.

6818

OBSERVATION OF ION DISSOCIATIONS WITH THE AID OF A PARABOLIC SPECTROGRAPH. H. Ewald and A. Henglein. Z. Naturforsch. 6a, 463-4(1951) Aug. (In German)

Highly monoenergetic ions were obtained in an instrument combining Shaw's ion source (Phys. Rev. 75, 1011 (1949)) with Thomson's parabolic spectrograph. Accordingly, ions of a given mass, formed through collisions with electrons, are represented on the spectrogram not by a segment of a parabola but by a dot. At higher pressures, each dot is followed by a thin parabola segment corresponding to lesser-energy secondary ions generated in the acceleration space through processes other than collisions with electrons. Some of these parabolas carry, besides the dot mentioned, one or more other dots representing ions formed in the zero-field space preceding the deviating fields as a result of dissociations due to collisions of ions with atoms of the residual gas.

6819

HIGH RESOLUTION MASS SPECTROMETRY. Clifford E. Berry and S. M. Rock. J. Chem. Phys. 19, 1208-9(1951) Sept. (Letter to the editor)

Some factors involved in obtaining high resolution on a commercial 180° analytical mass spectrometer are discussed. Improved resolution of ion pairs was obtained by use of an ion-optical means of reducing the slit to a virtual width <0.0065 in. Results are compared with those of Kniebes et al. (J. Chem. Phys. 19, 654(1951)).

MATHEMATICS

6820

Ames Lab.

A JACOBIAN METHOD FOR THE RAPID EVALUATION OF THERMODYNAMIC DERIVATIVES WITHOUT THE USE OF TABLES; by Richard C. Pinkerton. Oct. 15, 1951. 10p. (ISC-176)

Shaw's method of Jacobians for finding relations between any pair of thermodynamic variables (Trans. Roy. Soc. (London) 234A, 299-328(1935)) has been greatly simplified. It is first shown how the table used with Shaw's method can be rearranged and condensed so that it can be duplicated rapidly from memory without recalculation, then it is shown how any of the Jacobians may be set down immediately without the aid of tables.

MEASURING INSTRUMENTS AND TECHNIQUES

6821

Oak Ridge Inst. of Nuclear Studies

A METHOD FOR STANDARDIZATION OF GALLIUM^{72}; by Marshall Brucer, E. R. King, and H. D. Bruner. [nd] 7p. (ORO-44)

Since interest has developed in Ga^{72} as a diagnostic and therapeutic agent in bone malignancy, methods of measuring the activity or dosage of quantities of the isotope have become desirable. A technique is described whereby a Lauritsen electroscope is used to estimate the millicurage of a Ga^{72} sample. Details of γ calibration of the instrument against Ra and β calibration against RaDEF are given.

6822

North Carolina Univ.

DESIGN REPORT FOR ELECTROMECHANICAL SCANNER; by N. DiCostanzo, L. B. Williams, and A. V. Masket. July 17, 1951. 50p. (ORO-50)

Photographs and detailed blueprints of a mechanically driven nuclear-emulsion scanner are presented. The arrangement of motor, gears, and microscope is shown. Four actual-size photographs of nuclear stars are reproduced. No verbal description is included.

6823

Palmer Physical Lab., Princeton Univ.

AMMONIUM IODIDE AS SCINTILLATION COUNTER; by P. C. Gugelot. July 19, 1951. 9p. (NYO-973)

In an attempt to construct a proportional scintillation counter which may be used for the detection of fast neutrons a Tl-activated NH_4I crystal has been made, and some of its scintillation properties have been studied. Precautions necessary in growing the crystal are stated. The pulses of NH_4I (Tl) using a 5819 RCA multiplier and Los Alamos model-100 amplifier have a rise time of 1.5×10^{-6} sec, and the pulse

height is 1/15 that of NaI(Tl) for the photoelectrons of the Cs^{137} γ ray. Data taken several hours apart on the pulse-height distribution of Po α particles were completely reproducible and showed that very little surface deterioration took place within this time interval. The response to protons is derived from a tentative discussion of the α-particle pulse-size distribution. Above 0.5 Mev the light output is expected to be a linear function of proton energy.

6824
North Carolina Univ.
IDENTIFICATION OF PARTICLES RECORDED BY NUCLEAR EMULSIONS BY THE METHOD OF MULTIPLE SCATTERING; by L. C. Heck, G. E. Bilpuch, Don Pardue, and A. V. Masket. [nd] 42p. (ORO-49)

A method for identifying particles to be used in nuclear-emulsion plate calibration is given. The fundamental theory of determination of mass by measurement of the angle of scattering is explained. Range-energy relations for electrons, π and μ mesons, protons, deuterons, and α particles are plotted. Two different procedures for making laboratory measurements of the mean angle of scattering are described, one using a projection microscope and the other by using successive readings of the placement of the track image on an eyepiece scale in the microscope. A modified combined technique was developed which consists in projecting the image on the screen (using the monocular attachment) and taking readings directly from the screen. Several specific operating techniques are listed, and the detailed results of one example of particle identification are tabulated. Theoretical calculations were made for Ilford E1 and Eastman NTA emulsions. Calculations of the effect of 50% relative humidity indicated a negligible change in final results.

6825
Atomic Energy Research Establishment, Harwell, Berks (England)
BETA-GAMMA RADIATION MONITOR TYPE 1043C (Cat. No.3-7/5478); INTERIM MANUAL. [nd] 19p. (NP-3406)

6826
Atomic Energy Research Establishment, Harwell, Berks (England)
PORTABLE GAMMA RADIATION MONITOR TYPE 1030C (Cat. No. 3-7/5582); INTERIM MANUAL. Dec. 13, 1949. 11p. (NP-3411)

6827
DETERMINATION OF RADIOACTIVITY BY SOLUTION IN A LIQUID SCINTILLATOR. M. S. Raben and N. Bloembergen. Science 114, 363-4(1951) Oct. 5. (Technical paper)

The possibility that a simple and geometrically ideal counting system might be obtained by dissolving the material to be counted in a liquid scintillator has been investigated. A cell was improvised from flattened glass tubing and placed between the windows of two photomultiplier tubes. A light-tight shield was put around the cell and photomultipliers. The output pulses of the photomultipliers were fed into linear amplifiers and discriminator circuits of conventional design. A solution of C^{14} labeled sodium caproate in xylene was diluted with terphenyl in xylene and injected into the cell. It would appear from the results that the method is applicable to mμc amounts of C^{14}.

6828
AN AUTOMATIC PLATE COUNTER. Jerome L. Lerner and Donald F. Uecker. Rev. Sci. Instruments 22, 575-8 (1951) Aug.

A versatile counter is described that automatically sorts sample plates into several groups according to the radioactivity of the plates. The mechanical section which stores, moves, and collects the plates consists of hoppers for holding the plates before counting, a sample-changing disk, a collecting dish, and two small electric motors for rotating the disk and the dish. The sensory section contains an electronic system for determining the activity of the sample plate and consists of an ionization chamber, amplifier, scaler of variable scaling ratio, and a high-voltage supply. The control section, consisting mainly of a timing motor and several relays and switches, coordinates the action of the other two sections by determining the counting time and the sequence of operation.

6829
COUNTING OF RADIOACTIVITY IN LIQUID SAMPLES. R. F. Goddu and L. B. Rogers. Science 114, 99-100(1951) July.

When liquid samples are not counted immediately, two sources of errors are noted in using the counting technique proposed by Freedmon and Hume (Science 112, 461(1950)). First, in spite of careful lacquer coating of a metal container, the plating of a more noble metal onto a less noble metal is very probable and can cause a decrease in count. Second, the solvent can evaporate through the lacquer film over the sample. This loss can be reduced by placing the samples in a hygrostat after the lacquer film has dried. For best results, a correction should be applied for changes in the volume of the sample.

6830
NOMOGRAM FOR ESTIMATING DECAY OF I^{131} AND P^{32}. William B. Miller, Jr. Nucleonics 9, 58-9(1951) Oct.

A rapid estimate, useful in routine work, of the present activity of I^{131} or P^{32} can be made with the illustrated nomogram if the activity at some previous time is known. The nomogram comprises three scales representing the original activity, the elapsed time, and the present activity, a straight edge across the first two giving the desired value on the third.

6831
THE MEASUREMENT OF RADIOACTIVITY FOR TRACER APPLICATIONS. Alois Langer. p.439-99 of PHYSICAL METHODS IN CHEMICAL ANALYSIS. Vol. II. Walter G. Berl, ed. New York, Academic Press, Inc., 1951. 640p.

The photographic, ionization, and counting methods of detecting and measuring radioactivity are described, and construction of various types of counters is sketched. Preparation of solid, liquid, and gaseous samples is described. Radiometric titration and isotope dilution analyses are discussed briefly. 15 figures. 54 references.

6832
THE TEMPERATURE COEFFICIENT OF SCINTILLATION PHOSPHORS. W. L. Minarik and H. G. Drickamer. Rev. Sci. Instruments 22, 704-5(1951) Sept. (Laboratory and shop note)

A comparison of the counting rate as function of temperature of typical sodium iodide, anthracene, and calcium tungstate crystals was made. Sodium iodide has, by far, the flattest temperature profile. The counting rate of calcium tungstate decreases the fastest as the temperature increases, while the counting rate of anthracene decreases slowly at low temperatures but decreases very rapidly as the temperature approaches the melting point of the crystal. The scintillation crystals were fastened on the end of a 9-in. amorphous quartz rod which served as a light-conducting medium. It was found necessary to zero out the counts due to the rod. Typical curves of counting rate vs. end temperature are shown for quartz rods.

6833
DETECTOR AND PORTABLE RADIOACTIVITY METER. A. Agustin Tanarro and R. Rogelio Segovia. Anales real soc. españ. fís. quím. 47A, 193-6(1951) July-Aug. (In Spanish)

A small inexpensive apparatus for rapid measurement of radiation intensity has been designed and constructed. It

consists of a G-M counter tube, a high-voltage generating circuit, and a univibrator-integrator. Ordinary dry cells of the type used in portable radios furnish the power, and the high voltage is obtained by means of an oscillator circuit. The apparatus (with the exception of the G-M tube) is entirely enclosed in a metal box 20 by 15 by 10 cm., and the G-M tube is connected by a meter-long cable.

6834

COMPARATIVE STUDY OF ILFORD C2 AND G5 NUCLEAR EMULSIONS BY ANALYSIS OF THE REACTIONS $Be^9(d,t_\alpha^p)$. W. M. Gibson, R. M. Payne, and J. Catalá de Alemany. Anales real soc. españ. fís. quím. 47A, 151-60(1951) July-Aug. (In Spanish)

Ilford G5 and C2 nuclear-research emulsions were exposed under identical conditions to the reaction products from the bombardment of Be by analyzed 300-kev deuterons. The range-energy relationships for these two emulsions were found to be alike for particles with energy equal to or less than the maximum obtained in the Be^9 reactions (4.5 Mev for protons). For the group of fast protons the difference between the two emulsions is ~1.5 μ for ranges of the order of 133 μ. For the slow protons, tritons, and helium ions the emulsions are nearly identical.

6835

APPLICATION TO β SPECTRA OF THE TROCHOIDAL METHOD (A PROCESS OF FOCUSING IN AN INHOMOGENEOUS MAGNETIC FIELD). J. Lafoucrière. Ann. phys. (12) 6, 610-61(1951) July-Aug. (In French)

Some theoretical investigations on the trajectories of charged particles in an inhomogeneous magnetic field of high gradient and on the extension of the trochoidal method to continuous β spectra are presented in some detail. 38 figures.

6836

EFFECT OF TEMPERATURE ON COUNTERS AND RADIO TUBES. A. Daudin and J. Daudin. J. phys. radium 12, 564(1951) Apr. (Letter to the editor; in French)

Some observations are reported on the effect of temperatures as low as −19°C on counters and associated equipment continuously in unthermostated operation on the Pic du Midi. Methylal-vapor-filled counters were not sensitive to these temperatures. Losses in coincidence counts caused by changes in radio tube properties were important.

6837

ON TWO METHODS FOR DETERMINING THE URANIUM AND THORIUM CONTENTS OF THE GRANITES OF QUINTIN, BRITTANY: AUTORADIOGRAPHY OF POWDERED GRANITE AND A PHYSICOCHEMICAL METHOD. André Demay, Adolphe Lepape, and Marcel Geslin. Compt. rend. 232, 1950-2(1951) May 21. (In French)

The total activity, Th content, and U content of granite from Quintin, Brittany (Demay, Compt. rend. 232, 338, 639(1951); NSA 5-2479, 5-2480) have been determined by classical measurement of emitted Rn and Tn gas, and the U content also has been determined by fluorescence. The values obtained are in remarkable agreement with those found by Coppens (Bull. soc. franç. minéral. 73, 217(1950)) by autoradiography of powdered samples.

6838

BETA-RAY SPECTROGRAPHS WITH ELECTRON LENSES. (UNIFIED THEORY OF CLASSICAL TYPES AND A NEW APPARATUS.) II. P. Grivet. J. phys. radium 12, 1-14(1951) Jan. (In French)

The detailed design theory discussed in Part I (Grivet, J. phys. radium 11, 582-95(1950)) is extended to a β-ray spectrograph with a uniform field, to one with a single short winding, to the spectrographs of Siegbahn and of Siegbahn and Slätis (Phys. Rev. 75, 1955(1949)), and to a double spectrograph.

6839

DIFFUSION CLOUD CHAMBERS. Carl E. Nielsen, Theodore S. Needels, and Orville H. Weddle. Rev. Sci. Instruments 22, 673-82(1951) Sept.

Three forms of diffusion cloud chamber are described. Diagrams indicate their construction, and their operation is discussed. The direction of diffusion may be upward or downward. Various alcohols and water-alcohol mixtures may be used. A stable diffusion cloud chamber giving tracks of the quality shown in the typical photographs is simple to construct and operate. The sensitive volume, while necessarily in the form of a horizontal region shallower than the chamber itself, can be made to include most of the chamber volume. (auth)

6840

AUTOMATIC OPERATION OF A BETA-RAY SPECTROMETER. W. C. Kelly and K. J. Metzgar. Rev. Sci. Instruments 22, 665-7(1951) Sept.

Apparatus has been developed which permits the collection of data with a magnetic lens beta-ray spectrometer without requiring the attendance of the operator. The apparatus adjusts the focusing current and finds the time to accumulate a given number of counts. Forty-five sweep speeds are possible giving momentum intervals between plotted points ranging from 0.106 gauss-cm to 255 gauss-cm. (auth)

6841

CONSTRUCTION OF THE EXTERNAL-CATHODE GEIGER COUNTER. Merritt L. MacKnight and Robert L. Chasson. Rev. Sci. Instruments 22, 700-1(1951) Sept. (Laboratory and shop note)

An economical G-M counter is described as comprising a length of fluorescent lamp blank (0.032-in. soda-lime glass) with a conventional central wire but an external cathode of sprayed lacquer-base colloidal graphite, glyptal covered. The construction has also been successfully applied to neutron counters.

6842

A CIRCULAR GEIGER-MUELLER COUNTER. George Ensell and S. D. Chatterjee. Rev. Sci. Instruments 22, 700 (1951) Sept. (Laboratory and shop note)

A brief description is given of a toroidal G-M counter having a glass envelope, an inner Ag coating, and a circular central wire. An outer coating of red dye or colloidal graphite reduces the photosensitivity. Alternatively, the envelope may be of thin soda glass with an outer coating of aquadag as the grounded cathode.

6843

A POCKET IONIZATION CHAMBER WITH LOGARITHMIC RESPONSE. M. Brière, A. Rogozinski, and J. Weill. J. phys. radium 12, 697-9(1951) June. (Letter to the editor; in French)

A pistol-shaped ionization chamber designed for protection of personnel against radiation is described. The "barrel" is 10 cm long. Only one tube, a Victoreen 5803, is used. The instrument is graduated in 0.01, 0.1, 1, and 10 r received per 8-hr period.

6844

AN ELECTRONIC APPARATUS FOR THE STUDY OF RADIOACTIVITIES WITH SHORT LIVES. G. Vendryes and H. Savinelli. J. phys. radium 12, 759-69(1951) July-Aug.-Sept. (Letter to the editor; in French)

Activities with half lives of the order of 0.1 sec may be studied with an apparatus, the circuit for which is shown, attached to the 900-kv Greinacher generator of the Laboratoire Synthèse atomique. The circuit intermittently

deflects the beam from the target electrostatically and activates the immediately adjacent counters.

6845
PREPARATION OF UNIFORM SOLID SAMPLES FOR RADIOACTIVE ASSAY. M. L. Wright. Nature 168, 289-90(1951) Aug. 18. (Letter to the editor)

Sharply delineated samples of radionuclides are prepared by infrared evaporation of solutions in shallow (0.003 in.) machined depressions in Al disks. A current of hot air stirs the solutions until they dry. The method has been tested using NaBr solutions containing either Na^{24} or Br^{80}.

6846
DETERMINATION OF THE ENERGY $h\nu$ OF A γ RAY BY ABSORPTION OF THE PHOTOELECTRONS. Jacques Jacquesson and Armand Lataste. Compt. rend. 232, 1822-4(1951) May 16. (In French)

Breaks in the absorption curve of electrons ejected from a Au or other radiator by γ rays serve to determine the energy of one or more γ rays emitted by a source. The energy of the Au^{198} γ was measured to be 0.42 Mev. The two rays of W^{187} were found to have energies of 0.44 and 0.64 Mev. Precision of the method is > 10% for energies greater than 0.35 Mev. Above 1.2 Mev, the photoelectric cross section is too small to give easily observed breaks in the absorption curve.

6847
A β-RAY SPECTROMETER WITH MAGNETIC LENS. Pierre Hubert. J. phys. radium 12, 763-4(1951) July-Aug.-Sept. (Letter to the editor; in French)

The spectrometer is described briefly. Focusing of particles having an Hβ of 2.5×10^4 gauss-cm (about 6.5 Mev for electrons) is possible. No iron is used in producing the thick magnetic lens; the construction is thus economical.

6848
A GEIGER-MUELLER ULTRAVIOLET-RAY PHOTOCOUNTER WITH A FERRONICKEL CATHODE. J. Labeyrie. J. phys. radium 12, 569-70(1951) Apr. (Letter to the editor; in French)

The ferronickel layer constituting the photoemissive cathode is obtained by evaporation of the platinite wire anode under vacuum. The self-quenching, stable, and reproducible counter contains argon at 100 mm Hg and ethyl alcohol at 15 mm Hg pressure. It is very sensitive to ultraviolet light between 2000 and 3000 A and insensitive above 3600 A.

6849
THREE-DIMENSIONAL DISTRIBUTION OF CHARGED PARTICLES IN AN INHOMOGENEOUS MAGNETIC FIELD. APPLICATION TO β-RAY SPECTROGRAPHY. Joseph Lafoucrière. Compt. rend. 232, 1346-8(1951) Apr. 2. (In French)

The theory of median-plane focusing of particles from a point source at a distance from the center of an inhomogeneous field (Compt. rend. 229, 1005(1949); NSA 4-828) is extended to particles emitted at an angle to the median plane. Particles of a family which describes a trochoid in the median plane are confined by a surface tangential to that plane, whereas a family which is asymptotic to a stationary orbit in the plane is confined by a surface intersecting the median plane at a finite angle.

6850
STUDY OF HEAVY NUCLEI BY PHOTOGRAPHIC EMULSIONS. THINNING OF TRACKS. Tchang-Fong Hoang. J. phys. radium 12, 739-43(1951) July-Aug.-Sept.

In order to investigate the nature of the heavy nuclei (up to Z = 26) observed in the primary cosmic radiation or in nuclear transformations induced by cosmic rays, the author has derived a simple approximate expression giving the density n of δ rays as a function of Z and range R: $n = a Z^p R^{-b}$ (p = 1.54, b = 0.46, and a depends on the experimental conditions). The variation of thin-down length is shown to be linear with respect to Z.

MESONS

6851
Radiation Lab., Univ. of Calif.
SUMMARY OF THE RESEARCH PROGRESS MEETING OF MARCH 22, 1951; by Bonnie E. Cushman. Sept. 10, 1951. 8p. (UCRL-1208)

The products from the bombardment of 340-Mev protons on Cu^{63} and ^{65} have been examined. Yields of products relative to Cu^{61} are shown, and extrapolated probable yields in adjacent regions are also indicated. The region of maximum yield follows the line of the stable isotopes. Preliminary results of the scattering by carbon of mesons from the 184-in. cyclotron indicate a total scattering cross section at 90° of $d\sigma/d\Omega = 2.2 \pm 1.0 \times 10^{-26}$ cm²/ster. Tabulated results are compared with those obtained at Columbia and Cornell. A method for counting either positive or negative mesons has been developed. The particles are identified by pulse height and either Hρ or range and may therefore be counted without being stopped. Crystal scintillators are used, and the circuit may be used in coincidence or anticoincidence. The arrangement is diagramed, and the gain of the photomultiplier tube vs. voltage is plotted.

6852
Case Inst. of Tech.
NEW ASPECTS OF THE PSEUDOSCALAR MESON THEORY; by L. L. Foldy. [nd] 3p. (AECU-1659)

A canonical transformation is applied to the Hamiltonian describing the interaction of a neutral pseudoscalar meson field with a single nucleon through pseudoscalar coupling. The form taken by the Hamiltonian under this transformation shows that pseudoscalar coupling is equivalent to a nonlinear pseudovector coupling together with some additional nonspin-dependent nonlinear coupling terms. In addition, the transformed Hamiltonian is in a form which may be amenable to strong-coupling treatment.

6853
NUCLEAR ABSORPTION OF NEGATIVE PI-MESONS AT DIFFERENT ENERGIES. G. Bernardini, E. T. Booth, and L. Lederman. Phys. Rev. 83, 1075-6(1951) Sept. 1 (Letter to the editor)

Ilford G-5, 400-, and 600-micron nuclear emulsions were exposed to the 70- and 105-Mev external π^- meson beams of the Nevis cyclotron. To extend the energy range, additional plates were exposed to the 70-Mev beam behind 8 in. of lithium plus 1/2 in. of carbon. The nuclear interactions observed were analyzed and are tabulated for the energy ranges 30 to 50, 70 to 80, 69 to 90, and 100 to 110 Mev. A definite increase with energy of the relative frequency of absorption and inelastic scattering was observed. The general features of the stars do not change with the π^- energy, and it is evident that a large fraction of the absorbed energy is carried away by neutral particles (neutrons).

6854
THE IONIZATION LOSS OF μ MESONS AT RELATIVISTIC ENERGIES IN ANTHRACENE. Theodore Bowen and Francis X. Roser. Phys. Rev. 83, 689-90(1951) Aug. 1.

Ionization energy losses of μ mesons in the cosmic radiation at sea level in passing through an anthracene crystal have been measured. Pb absorbers were used to determine three energy bands for μ mesons. The experimental points on the curve of energy loss vs. meson energy are in good agreement with the theoretically expected curve for the most probable energy loss, when corrected for the density effect in anthracene. The most probable ionization loss in anthracene indicates a relativistic increase of less than 2% between

300 and 3000 Mev for μ mesons. The results of this experiment appear to establish definitely the existence of the reduction in ionization loss caused by the density effect.

6855

TOTAL CROSS SECTIONS OF π MESONS ON PROTONS AND SEVERAL OTHER NUCLEI. C. Chedester, P. Isaacs, A. Sachs, and J. Steinberger. Phys. Rev. 82, 958-9(1951) June 15. (Letter to the editor)

Report is made of preliminary results of a study, by means of counter techniques, of the total cross sections of various nuclei for mesons. Total cross sections for 85-Mev π^- mesons are (in 10^{-26} cm^2): H, 1.33 ± 0.11; Li, 24.2 ± 1; Be, 25.3 ± 2; C, 34.4 ± 1.3; O, 46.6 ± 1.8; Al, 62.3 ± 2.5; Cu, 99 ± 5; Cd, 159 ± 7; Pb, 240 ± 11. The small H cross section leads the authors to state that the interaction of the meson with the nucleon seems to be not so strong as would be required for the success of strong coupling theories or the statistical considerations of Fermi (Progress Theoret. Phys. (Japan) 5, 570(1950)). Neither is it so weak that perturbation theory can be expected to be valid. The small H cross section rules out those interpretations of the meson interaction in heavy elements which are based on the idea that mesons scatter violently inside nuclei before either being absorbed or finally reemitted.

6856

NEUTRAL MESONS PRODUCED IN THE CAPTURE OF π^- MESONS IN HYDROGEN. A. Sachs and J. Steinberger. Phys. Rev. 82, 973(1951) June 15. (Letter to the editor)

Two groups of γ rays (130 and 70 Mev) have been observed by Panofsky et al. (Phys. Rev. 81, 565(1951)) in the interaction of π^- mesons with H. The analysis of the experiment and the conclusions which may be derived from it rest on the assumptions (a) that the γ rays are due to mesons, (b) that these mesons have come to rest, and (c) that the low energy γ rays are the decay products of neutral mesons. The verification of these assumptions for the low-energy group has now been accomplished experimentally. Collimated mesons produced in the Columbia cyclotron were decelerated by passing through an absorber and then entered a vessel filled with H_2. Liquid scintillation counters in coincidence were placed on each side of the chamber behind Pb converters. The counting rate without converters was negligible; the coincidence rate varied with absorber thickness; the counting rate when the H_2 was replaced by He was negligible. Thus it was proved that some fraction of negative mesons coming to rest in the atomic orbits of H nuclei are converted into neutral mesons.

METEOROLOGY

6857

METEOROLOGICAL ASPECTS OF THE ATOMIC "BASE SURGE." B. G. Holzman. Bull. Am. Meteorol. Soc. 32, 251-8(1951) Sept.

The Bikini (Baker Test) underwater atomic explosion is described and the point is made that the spectacular cloud formation associated with the "base surge" was dependent upon the moist tropical air mass prevailing at the time of the explosion. (auth)

NEUTRONS

6858

Atomic Energy Research Establishment, Harwell, Berks (England)

ANALYSIS OF HIGH ENERGY NEUTRON PRODUCTION; by F. Mandl and T. H. R. Skyrme. [nd] 13p. (AERE-T/R-745)

The energy spectra of neutrons scattered in the forward direction when different target nuclei are bombarded with high energy protons are calculated and compared with recent measurements. The calculation is subdivided into three stages. (1) As a crude analog to the nuclear scattering, the scattering of a single neutron in a square well is calculated using Born approximation. (2) Single scattering processes are estimated classically using the results of (1) to allow for the momentum distribution of the target neutron, and allowing for the attenuation of incident and scattered beams. (3) Multiple scattering is estimated similarly. Several simplifying assumptions have to be made and double collisions only are estimated. The calculated differential cross sections are in fairly good agreement with experiment, but the calculated energy-spectrum falls off too quickly. The effect of neglecting certain processes, such as triple collisions, is discussed, as well as the applicability of the nuclear model used. (auth)

NUCLEAR PHYSICS

6859

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

ELEMENTARY PARTICLE SCATTERING GROUP AND GENERATOR CONSTRUCTION AND HIGH VOLTAGE RESEARCH GROUP, p.15-27 of PROGRESS REPORT; AUGUST 31, 1951. 13p. (NP-3391, (p.15-27)

Targets of carbon, paraffin, and heavy paraffin were exposed to the photon beam of the M.I.T. 330-Mev synchrotron. The energy distributions of photomesons from carbon, hydrogen, and deuterium obtained at 26 and 90° are described. The three geometrical exposure and counting arrangements used in the linear-accelerator investigation of the angular distribution of fission fragments in the photofission of Th are shown. All the data so far seem to fit an assumed distribution of activity $a + b \sin^2\theta$, with $b/a = 0.25 \pm 0.08$. For Van de Graaff accelerators a new system of transferring electric charging to and from the charge-conveyor belt is briefly described. It appears to be free from many of the limitations of the corona-transferring systems conventionally used. This so-called induction-conduction charging method makes use of a thin semiconducting layer on the inside surface of an otherwise insulating belt.

6860

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

RADIOACTIVITY AND CYCLOTRON, SYNCHROTRON, AND THEORETICAL GROUPS, p.72-95 of PROGRESS REPORT; AUGUST 31, 1951. 24p. (NP-3391(p.72-95))

The observations of Frauenfelder et al. (Phys. Rev. 82, 549(1951)) of a marked anisotropy in the correlation of the γ rays in the decay of In^{111} involving the 7×10^{-8}-sec excited state in Cd^{111} have been confirmed. Evaporated metal sources, electroplated In sources, and In^{+3} ion in sulfate solution show the anisotropy, but the correlation is substantially isotropic for indium oxide sources. Measurements of the decay rate of orthopositronium in CCl_2F_2 as a function of pressure have been continued. The present best value for the decay rate is $\lambda_0 = (6.8 \pm 0.7)10^6$ sec^{-1}, in excellent agreement with theory. Pulse-height curves are shown which illustrate the suppression of three-quantum annihilation in favor of the two-quantum process by nitric oxide. The cross section of the NO molecule for ortho-para-positronium conversions is 7.6×10^{-17} cm^2. About 1 in 10 collisions with a NO molecule results in ortho-para conversion. The energy difference between the ortho and para states of positronium has been measured, and the exchange interaction between positron and electron has been evaluated experimentally for the first time. The experiments using the cyclotron emergent beam have been extended to comprise also correlations between scattered particles and γ rays. Data are given on angular correlation between inelas-

tically scattered protons and γ rays from the 1.4-Mev level in Mg^{24} and on pα coincidences from the $Al^{27}(d,p\alpha)Na^{24}$ reaction. The angular distribution of elastic scattering of 30-Mev α particles by He has been measured and the results are plotted. The effect of the formation of negative ions in a proportional counter has been studied. CCl_4 has the greatest effect in lowering pulse height, ammonia the least, as compared to pure methane and methane plus a small amount of freon-12. The reports of the synchrotron and theoretical groups are brief, and no quantitative information is given.

6861
THE ELECTRON-NEUTRON INTERACTION. L. L. Foldy. Phys. Rev. 83, 688(1951) Aug. 1. (Letter to the editor)

The reported existence of a weak attractive interaction between electrons and neutrons has usually been explained on the basis of current meson theories of nuclear forces as a consequence of the partial dissociation of a neutron into a proton and virtual negative meson. It is now pointed out that an electron-neutron interaction of the desired character and magnitude can also be obtained as a direct consequence of attributing to a neutron an anomalous magnetic moment without any further assumptions. When one calculates the electromagnetic properties of nucleons according to meson theory by canonical transformations which remove the coupling of the mesons to the nucleon to any given order in the meson coupling constants, one obtains interaction terms representing the anomalous magnetic moment of the nucleon interacting with the magnetic field, together with its relativistic complement expressing the interaction of an electric dipole moment for the nucleon with the electric field, plus an additional term which gives rise to a direct electron-neutron interaction. In the calculations employing this method only the last term has been compared with the experimental interaction. Actually, the electric dipole moment term gives in second order an additional contribution which is exactly that found by assuming an anomalous magnetic moment for the neutron and which must be added to the direct term before the comparison with experiment is made.

6862
NUCLEAR MOMENTS AND THE STRUCTURE OF THE NUCLEUS. Jeane-Claude Pecker. J. phys. radium 12, 682-93(1951) June. (Review; in French)

Determination of nuclear moments from atomic spectra, relation of nuclear moments to atomic structure, magic numbers, etc., are discussed. 140 references.

6863
NOTE ON NUCLEAR RADII. Daniel Curie. J. phys. radium. 12, 570-1(1951) Apr. (Letter to the editor; in French)

The law $R^3-r^3 = K(A-a)$ is suggested for the radii R of any nuclei in order to take account of the filling-in of the nucleon shells. A is the total number of nucleons and a is the number in the last filled shell of radius r. The following equations have been obtained by fitting the most recent experimental data on nuclear radii. From Li to O, $R^3-(1.5)^3 = 5.0(A-4)$; O to Ca, $R^3-(3.91)^3 = 3.5(A-16)$; Ca to I, $R^3-(5.25)^3 = 1.84(A-40)$; and above Sn, $R^3-(6.48)^3 = 2.46(A-79)$. A somewhat better fit above Pb is obtained by the formula $R^3-(7.72)^3 = 3.68(A-207)$. Certain irregularities may indicate that a shell starts to fill before the preceding shell is complete.

NUCLEAR PROPERTIES

6864
Brookhaven National Lab.
NUCLEAR ISOMERS AND SHELL THEORY (abstract); by M. Goldhaber. Sept. 14, 1951. 1p. (AECU-1644)

The report is reproduced here in its entirety.

When a nucleus remains in an excited state for a considerable time it is called an isomer. Isomers occur in "islands," close to the "magic numbers," which shell theory can explain. They correspond to the closing of shells and therefore to particularly tight binding of nuclei. Near the end of a shell, states of very different angular momentum are adjacent. The γ-transitions between such states are highly forbidden, hence isomers exist there.

6865
THE LITHIUM-7 NUCLEUS. C. M. Class and S. S. Hanna. Nature 168, 429(1951) Sept. 8. (Letter to the editor)

A thin target of Li^6, prepared in a mass spectrograph and maintained constantly under vacuum, was bombarded with 0.80-Mev deuterons from an electrostatic generator. The protons and γ rays from the reaction $Li^6(d,p)Li^{7*}(\gamma)Li^7$ were detected with suitable scintillation counters, and successive proton-γ emissions were observed by operating the counters in coincidence. The coincidence rate was measured at nine settings of the γ counter from 35 to 145°. A least-squares analysis of the data into a cosine series gave a coefficient of $\cos^2\theta$ which is less than 3% of the isotropic term. The failure to detect a correlation is consistent with the assignment of $I = \frac{1}{2}$ to the 480-kev state.

6866
31-KEV EXCITED STATE OF ALUMINIUM-28. R. D. Smith and R. A. Anderson. Nature 168, 429-30(1951) Sept. 8. (Letter to the editor)

A search has been made for γ radiation resulting from de-excitation of the excited state at 31 ± 2 kev in Al^{28} reported by Strait et al. (Phys. Rev. 81, 747(1951)). An Al target was bombarded with 700-kev deuterons. Radiation of energy 31.4 ± 1.0 kev was detected at 90° to the deuteron beam with a proportional counter. Absorption measurements were also consistent with an energy of ~31 kev. The yield was estimated as $1.1 \pm 0.5 \times 10^3$ γ per μ coulomb. No internal-conversion electrons corresponding to the 31-kev γ ray were detected in examinations with a 180° magnetic spectrometer.

6867
ANGULAR DISTRIBUTIONS FROM (d,p) AND (d,n) NUCLEAR REACTIONS. S. T. Butler. Proc. Roy. Soc. (London) 208A, 559-79(1951) Sept. 24.

Experimental angular distributions from (d,p) and (d,n) nuclear reactions involve contributions from incident angular momenta much higher than is compatible with compound nucleus formation, and indicate that these reactions must proceed to a large extent by means of a stripping process. The angular distributions to be expected from a stripping process are calculated, and these are found to be very sensitive to the angular momenta which can be accepted by the initial nucleus, i.e., to the spins and parities of the energy levels involved. In any one case there is found excellent agreement between the experimental curve and just one of the possible theoretical curves, and if the spin and parity of the ground state of the initial nucleus is known, this allows of a determination of the spin and parity of the appropriate level of the final nucleus. In this way it is $\frac{1}{2}$ found, for example, that the ground state of O^{17} has spin or $\frac{3}{2}$ and even parity, and that the first excited state of O^{17} (0.88 Mev above ground) has spin $\frac{1}{2}$ and even parity. Determinations are also made of the spins and parities of the ground states and several excited states of C^{13}, N^{15}, and Al^{29}. Families of theoretical curves for a variety of incident and outgoing energies are presented in order to facilitate further spin and parity determinations from future experimental results. (auth)

6868
NUCLEAR SPIN OF RUBIDIUM-86. E. H. Bellamy. Nature 168, 556(1951) Sept.

The nuclear spin of Rb^{86} has been measured as I = 2 by the atomic beam method, using magnetic resonance. A tentative value of -1.68 ± 0.01 nuclear magnetons is found for the magnetic moment.

6869
THE NUCLEAR SURFACE ENERGY. W. J. Swiatecki. Proc. Phys. Soc. (London) 64A, 226-38(1951) Mar.

The kinetic and potential parts of the nuclear surface energy are calculated on the basis of the statistical model of the nucleus taken to first order and using a gaussian interaction between particles. The resulting surface energy is found to be of the right order of magnitude, the calculated figure being in fact 55% of the empirical value. (auth)

NUCLEAR REACTORS

6870
Brookhaven National Lab.
THE INTEGRITY OF THE BIOLOGICAL SHIELD OF THE BROOKHAVEN REACTOR; by W. C. Reinig and S. J. Harris. May 15, 1951. 10p. (BNL-119)

To determine the integrity of the biological shield of the Brookhaven nuclear reactor, a major survey project using several techniques was initiated by the Health Physics Division. More than 4000 γ readings and several hundred neutron surveys were taken, complemented and supplemented by intensive radiography of the shield. It was found that design specifications are met.

NUCLEAR TRANSFORMATION

6871
Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
NUCLEAR CROSS SECTIONS GROUP, p.49-71 of PROGRESS REPORT, AUGUST 31, 1951. 23p. (NP-3391(p.49-71))

The $Na^{23}(d,p)Na^{24}$ reaction has been studied and 5 additional levels are tentatively assigned to Na^{24} at 3.74, 3.90, 3.93, 3.97, and 4.20 Mev. Eighteen excited levels of F^{20} resulting from $F^{19}(d,p)F^{20}$ have been identified in the region of excitation from 0 to 4.94 Mev. Q-values and excitation energies are tabulated, and an energy-level diagram for F^{20} is proposed. Investigation of the $Mg^{24}(d,p)Mg^{25}$ reaction is also reported in detail. The $Mg^{25}(d,p)Mg^{26}$ reaction was observed for the first time and 4 proton groups were assigned to it. The $Mg^{25}(d,\alpha)Na^{23}$ reaction was observed; the Q-value of the ground-state transition was measured as 7.013 ± 0.013 Mev. A second α-particle group was assigned to $Mg^{25}(d,\alpha)Na^{23}$, corresponding to a hitherto unreported level in Na^{23} at 0.43 Mev. One proton group from the natural Mg target was assigned to the ground-state transition of the $Mg^{26}(d,p)Mg^{27}$ reaction. The existence of two groups corresponding to new levels in Mg^{25} at 2.73 and 2.79 Mev observed in the $Al^{27}(d,\alpha)Mg^{25}$ reaction has now been confirmed. The agreement in excitation energies in Mg^{25}, as measured from the $Al^{27}(d,\alpha)$ and $Mg^{24}(d,p)$ reactions, is excellent for most of the levels. In order to identify correctly the proton groups from the $P^{31}(d,p)P^{32}$ reaction, a new survey has been made using targets of copper phosphate and zinc phosphide evaporated onto platinum backings. The survey has been extended down to a proton energy of 2.4 Mev, and the Q values of the proton groups, relative intensities, and level scheme for P^{32} are given. The present investigation has revealed additional structure in the level scheme of P^{32}, which had not previously been resolved.

6872
Los Alamos Scientific Lab.
FISSION NEUTRON SPECTRUM OF U^{235}; by Norris Nereson. [nd] 14p. Decl. Oct. 15, 1951. (AECD-3250; LADC-1053)

The energy distribution of neutrons (prompt and delayed) arising from thermal fission of U^{235} has been studied with Ilford C2 nuclear plates. The spectrum obtained shows a maximum in the region 0.7 to 0.8 Mev and an exponential slope of 3.9 ± 0.2 Mev per decade in the energy region above 2 Mev. The data extend over the energy range 0.4 to 7 Mev. (auth)

6873
Rochester Univ.
SPALLATION PRODUCTS FROM COBALT AND 270-MEV PROTONS; by Genevieve Wagner and Edwin O. Wiig. [nd] 6p. (NYO-703)

The nuclear reactions resulting when thin targets of pure Co were bombarded with 270-Mev protons have been studied. The specific nuclides were identified by resolution of the gross decay curves of each chemically separated fraction. Verification was obtained by β-ray-spectrometer and absorption measurements. All the activities observed (20-min to 100-day half life) were assigned to known nuclides Ni^{57}, $Co^{58,56,55}$, Fe^{52}, $Mn^{56,52}$, Cr^{49}, $Sc^{44,43}$, K^{42}, and $Cl^{39,38}$. An inspection of the relative yields with decreasing atomic number reveals an alternation in magnitude superimposed on a steady decrease in yield. The yield of Co is large, of Fe small, of Mn large, of Cr small. Pure Cu was bombarded with 250-Mev protons, and two positron activities were observed corresponding to Ga^{66} and Ga^{68}, respectively. It appears that Ga^{66} and Ga^{68} were produced by secondary (α, n) reactions on natural Cu^{63} and Cu^{65} and that α particles are a product of spallation.

6874
Brookhaven National Lab.
YIELDS OF IRON ISOTOPES IN HIGH ENERGY NUCLEAR REACTIONS; by J. M. Miller and G. Friedlander. [nd] 2p. (AECU-1648)

The relative disintegration rates of Fe^{52} and Fe^{55} have been obtained directly by comparison of the 8-hr and long-lived Mn x-ray activities as measured with a proportional counter and pulse-height analyzer. Co and Cu targets were bombarded with 370-Mev protons. With thin targets (~5-Mev energy loss) the ratios of formation cross sections (σ_{55}/σ_{52}) were 136 ± 20 and 168 ± 25 for Co and Cu targets, respectively. With a thick Cu target (energy loss ~60 Mev) a ratio of 206 ± 30 for (σ_{55}/σ_{52}) was obtained. By absolute β- and x-ray counting, the ratio of formation cross sections for Fe^{59} and Fe^{52} was found to be $\sigma_{59}/\sigma_{52} = 45 \pm 15$ in the bombardment of the thick Cu target.

6875
PROBABLE EMISSION OF A BERYLLIUM-8 NUCLEUS IN THE FAST NEUTRON FISSION OF THORIUM-232
E. W. Titterton. Phys. Rev. 83, 1076-7(1951) Sept. 1 (Letter to the editor)

In photographic plate experiments on the fast-neutron fission of Th^{232} using 2.5-Mev D-D neutrons, an event was observed in which two light-particle tracks emanate from the point of fission in addition to the two heavy fragments. The event is interpreted as representing the fast-neutron ternary fission of a Th^{232} nucleus, the third fragment being a Be^8 nucleus in its ground state emitted with an energy of 19.6 ± 0.5 Mev at an angle of 62° to the fission fragment of smaller charge. The Be^8 disintegrates into two α particles with energies of 10.0 and 9.6 Mev, inclined at 9° to each other. The energy release in such a disintegration is 120 10 kev, somewhat larger than the measured value for the instability of the ground state of Be^8.

6876
THE REACTION OF THERMAL NEUTRONS WITH BORON.
Pierre Cüer and Jean-Pierre Lonchamp. Compt. rend. 232, 1824-6(1951) May 16. (In French)

Ilford E1 + B emulsions charged with borate have been used in the study of the $B^{10}(n,\alpha)Li^7$ and $B^{10}(n,\alpha)Li^{7*}$ reactions. Energies, range in air, range in emulsion, and stopping power are listed for the two α and two Li tracks. Measurements of 30,531 tracks have given the ratio $\sigma_{Li^7}/\sigma_{Li^{7*}} = 4.27 \pm 0.15\%$, which is significantly below the value of $5.8 \pm 0.1\%$ found by Hanna (Phys. Rev. 80, 530 (1950)) using a BF_3 counter.

6877
DETERMINATION OF THE CROSS SECTION FOR THE DISINTEGRATION OF NITROGEN BY THERMAL NEUTRONS. P. Cüer, J.-P. Lonchamp, and S. Gorodetzky. J. phys. radium 12, 6S-7S(1951) Feb. (In French)

By comparing the tracks in nitrogen-loaded Ilford E1 emulsion with those in boron-loaded Ilford C2 when both were exposed to thermal neutrons, the authors have found the cross section of the reaction $N^{14} + n \rightarrow H^1 + C^{14}$ to be 1.77 ± 0.09 barns.

PARTICLE ACCELERATORS

6878
Case Inst. of Tech.
ORBITAL CAPTURE AT INJECTION IN BETATRONS (Technical Report No. 11); by E. C. Gregg, Jr. [nd] 31p. (AECU-1660)

Through the use of a magnetic pulse perturbation technique, the time during which electron trapping occurs and the trapping time relative to the injection voltage or current may be observed. Such measurements have been made as a function of the slope of the injection voltage pulse and the current at the time of injection, and show trapping for $(dV_i/dt) \lesssim 0$ and an acceptance time of about $\frac{1}{2}$ μ sec. The parabolic law was also shown to hold. Measurements were made of the magnetic field perturbations due to electron injection and only a 16-maxwell change was found within the orbit due to the bending of the major portion of the injected electrons. These and other observations have led to the conclusion that successful trapping results primarily from resonance damping, and further that if any electrons are trapped on the leading edge, the perturbations due to trailing-edge trapping remove these and effectively trap a like number through equivalent processes. (auth)

6879
Westinghouse Electric Corp.
ELECTRICAL EQUIPMENT FOR THE BEVATRON; by J. V. Kresser. [nd] 18p. (AECU-1654)

The magnet power supply of the University of California Radiation Laboratory bevatron consists of two flywheel motor-generator sets that supply energy to the magnet through Ignitron power converters. Windings, circuits, load cycles, rectification, and protective equipment for this equipment are described. 5 figures.

6880
Case Inst. of Tech.
A CONSTANT ENERGY EXPANSION SYSTEM FOR A FIELD-BIASED BETATRON; by K. D. Broadbent and E. C. Gregg, Jr. Sept. 5, 1951. 15p. (AECU-1661)

An integrating system for triggering the expansion of a field-biased betatron at any particular preset energy level is described along with a discussion of the various errors arising in such a system. Calibration methods as well as certain operational checks are also described. (auth)

6881
ON RESONANCE DAMPING AT INJECTION IN BETATRONS AND SYNCHROTRONS. S. E. Barden. Proc. Phys. Soc. (London) 64B, 579-90(1951) July.

It is shown that under special conditions of injection, damping of electron oscillations can occur in "imperfect" cyclic accelerators, i.e., those with an azimuthally inhomogeneous electromagnetic field, in the presence of resonance between their different periodic motions. This mechanism is invoked to explain the successful injection of electrons in most betatrons and synchrotrons. The necessary coupling inhomogeneity to induce resonance damping at injection can be created by the large currents circulating during this period in the acceleration cycle. (auth)

6882
MULTIPLE TRAVERSAL OF CYCLOTRON TARGETS. J. M. Cassels, J. M. Dickson, and J. Howlett. Proc. Phys. Soc. (London) 64B, 590-4(1951) July.

In high energy cyclotrons the accelerated particles may pass through the target more than once. The average number of traversals is calculated theoretically and compared with experimental results. Good agreement is found. (auth)

6883
THE CONSTRUCTION OF A SMALL LINEAR ACCELERATOR. Haruhiko Morinaga. J. Phys. Soc. Japan 6, 210-11(1951) May–June.

A small linear accelerator for protons has been constructed to study the possibility of using such devices in bombarding experiments. A special type of cavity resonator suitable for the acceleration of relatively low-energy particles was developed for this purpose. The cavity has 9 gaps surrounded by a glass cylinder. The resonant wavelength was found to be 4 m for the cavity of diameter 1 m and length ½ m. For 40-kv injection energy the first gap is 9 mm. The length of a gap and the length of the neighboring electrode are almost equal, and both are made longer as the proton energy increases. Power up to 4 kw is fed into the cavity by coupling the filament loop of a grounded anode oscillator with two TR594A transmitter tubes in push-pull connection. With 45-kv injection energies and 3-kw plate input of the oscillator, accelerated protons have acquired energies of ~150 kv.

6884
EXCITATION SYSTEM FOR A SYNCHROTRON. J. D. Ryder and J. P. Palmer. Elec. Eng. 70, 673(1951) Aug.

The excitation of a 70-Mev synchrotron magnet involves single-phase supply of loss energy to a tuned circuit, usually resonant at 60 cycles, wherein approximately 3,000 kva are circulating. It usually is considered necessary that the input frequency be held within ±0.3 cycle of the magnet-circuit resonant frequency. It is possible to supply the magnet from an a-c generator, motor-driven through an adjustable-speed magnetic drive, the latter being controlled automatically through electronic circuits such that the generator speed and output frequency is always at a value to induce resonance in the magnet circuit. Such an arrangement is described, and a block diagram of a resonant frequency control system is presented.

6885
A NEW TYPE OF HIGH-INTENSITY ION SOURCE. J. Sommeria. J. phys. radium 12, 563-4(1951) Apr. (Letter to the editor; in French)

The ionization source is of annular shape and is inserted in the annular gap of a magnet. The resulting beam of ions is of tubular shape, a form particularly favorable from the point of view of dispersion effects caused by space charge. High intensity may be obtained.

6886
MATHEMATICAL DATA FOR ELECTRON DRAIN ON POSITIVE ION SOURCES. S. E. Rauch. J. Applied Phys. 22, 1128-32(1951) Sept.

A study of the motion of electrons moving in the presence of crossed electric and magnetic fields is presented. Special electromagnetic regions are selected for discussion which assist in the controlling of electron discharge on positive ion sources when used with large mass-spectro-

graph units. The article compares the components of motion parallel and perpendicular to the magnetic field in the following regions: uniform crossed electric and magnetic fields; electric field produced by nonparallel plane condenser plates, uniform H parallel to one plate; electric field produced by coaxial circular cylindrical condensers, uniform magnetic field normal to axis of cylinders; uniform electric field, circularly bowed magnetic field. The components of motion are expressed in terms of mathematical functions, and where it is deemed useful, additional results are presented in graphical form so that the conclusions can be applied with a minimum of calculations. (auth)

RADIATION ABSORPTION AND SCATTERING

6887

Wisconsin Univ.

THE ELASTIC SCATTERING AND CAPTURE OF PROTONS BY OXYGEN (thesis); by Richard Alan Laubenstein. 1950. 86p. (AECU-1652)

The scattering and capture of protons from an electrostatic generator by oxygen has been investigated. A magnetic analyzer was used in measuring the scattering cross section over the energy range 0.4 to 4.5 Mev. The target for the scattering experiments was barium oxide on 1000-A Ni foil; a target of barium oxide on a diamond backing was used to check the data. The yield curve obtained for the elastic scattering is shown. Results obtained with thin targets indicate that the 2.66-Mev resonance is 20 kev wide and appears as an almost symmetrical dip in the cross section. The best experimental value for the absolute elastic-scattering cross section is $3.1/4\pi$ barns per steradian at 2.2 Mev. To investigate the capture cross section, targets of tantalum oxidized by electrolysis in distilled water were bombarded with protons from the electrostatic generator, and the resulting F^{17} activity in the target was measured. A value of 66.3 ± 1 sec was found for the F^{17} half life. The data are analyzed, and the energy levels in the mirror nuclei O^{17} and F^{17} are discussed at length.

6888

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

NUCLEAR SHIELDING STUDIES; XII. A QUADRATURE METHOD FOR COMPUTING NEUTRON DISTRIBUTIONS IN TWO DIMENSIONS (Technical Report No. 52); by E. L. Secrest. July 16, 1951. 121p. (NP-3390)

An attempt has been made to solve the transport equation, which governs absorption and diffusion of neutrons through matter, for problems in two dimensions. An iterative method has been developed which, when combined with a quadrature approximation, allows derivation of approximate solutions of the transport equation. An integral relation for the neutron distribution function has been set up in a form suitable for an iterative solution. In order to carry out the iteration the assumption has been made that the neutron distribution at a given point in space can be represented by neutron flow along a finite number of streamlines. Since the method is expected to be most useful when the problem under consideration differs but slightly from a similar problem with a known solution, several such examples have been worked out. The effect of introducing a void in the form of a slit into a semi-infinite medium (either capturing or noncapturing, infinite or finite) has been considered in some detail. Although the investigation has been carried out primarily for the one-velocity form of the transport equation, a procedure has been indicated whereby energy dependence of the distribution can be included to a limited extent.

6889

Atomic Energy Research Establishment, Harwell, Berks (England)

ENERGY FLUX AND AVERAGE ENERGY OF NEUTRONS SCATTERED BY THE WALLS OF A LABORATORY; by (Mrs.) M. E. Mandl. [nd] 16p. (AERE-T/R-727)

The average energy of the returned neutrons and the energy flux of neutrons scattered back to the source is calculated for a source at the center of a spherical room. The walls of the room are assumed to be of some noncapturing material having scattering properties similar to concrete.

6890

NEUTRON-PROTON SCATTERING WITH REPULSIVE FORCES. P. O. Olsson. Phys. Rev. 83, 845(1951) Aug. 15. (Letter to the editor)

The n-p scattering at 90 and 260 Mev has been calculated using central forces and a square well with an impenetrable inner sphere. Results were in such poor agreement with experimental values that a strong repulsion can hardly be present in the n-p interaction in triplet states of even parity.

6891

RANGES OF HIGH ENERGY ELECTRONS IN WATER. J. S. Laughlin and J. W. Beattie. Phys. Rev. 83, 692-3 (1951) Aug. 1.

The ionization produced in a small movable ion chamber immersed in a water tank has been used to determine the ranges of electrons from 5 to 22 Mev from the University of Illinois betatron. Typical distributions of ionization as a function of depth in water produced by a 6-cm-diam electron beam are shown. The ranges extrapolated from such distribution graphs appear to be independent of field size, and the points lie close to the range-vs.-energy curve of Halpern and Hall (Phys. Rev. 73, 477(1948)), in which density effects are considered.

6892

SCATTERING OF 146-MEV PROTONS BY DEUTERONS. J. M. Cassels, G. H. Stafford, and T. G. Pickavance. Nature 168, 556-7(1951) Sept.

The differential scattering cross section for the scattering of 146-Mev protons by deuterons, as a function of angle in the center-of-mass system is shown in a graph; the scatterer was a rectangular strip of heavy water contained in a capsule of thin Al sheet. Both the scattered protons and the corresponding recoil deuterons were detected in coincidence.

6893

ON THE SCATTERING OF SLOW ELECTRONS BY HYDROGEN ATOMS. Tor B. Staver. Arch. Math. Naturvidenskab 51, No. 3, 29-59(1951).

The problem of elastic scattering of slow electrons by hydrogen atoms is investigated by the variational method. Elastic scattering without polarization is discussed, and then the effects of exchange and polarization are evaluated approximately. The change in phases due to polarization is roughtly 10 to 15%. Chandrasekhar's calculation of the continuous absorption coefficient in the solar atmosphere (Astrophys. J. 104, 430(1946)) is discussed. He had concluded tentatively that the negative hydrogen ion by itself is able to account quantitatively for the entire continuous spectrum of the sun over the range of wavelengths λ = 4000 to 25,000 A. After discussing the effects of exchange and polarization, which Chandrasekhar neglected, the author agrees with this conclusion.

6894

THE SCATTERING PHASE SHIFTS OF TWO-NUCLEON SYSTEMS. S. A. Kushneriuk and M. A. Preston. Proc. Phys. Soc. (London) 64A, 712-25(1951) Aug.

Energy expansions for simple functions of the scattering phase shifts are given for all relative angular momenta for central forces in neutron-proton and proton-proton scattering and for noncentral static forces in proton-proton scattering including the coupling of P and F states. The differential scattering cross section for this latter case is given in an appendix. (auth)

6895
POLARIZED NUCLEAR REACTIONS. R. J. Blin-Stoyle. Proc. Phys. Soc. (London) 64A, 700-11(1951) Aug.

Using properties of states of quantized angular momentum, general formulas are obtained for the angular distribution in nuclear reactions and scattering processes in which the bombarding particles and target nuclei are polarized. A simple symmetrical formula for use in specific calculations is given. The following cases are considered in detail: (a) polarized bombarding particles only, (b) target nuclei polarized in a magnetic field and bombarded by polarized particles. Finally, general predictions are made concerning the polarization of particles resulting from any reaction or scattering process and the results applied to the D–D reaction which is suggested as a source of fast polarized neutrons and protons. (auth)

6896
THE INELASTIC SCATTERING OF VERY SLOW NEUTRONS BY ALUMINIUM. J. M. Cassels. Proc. Roy. Soc. (London) 208A, 527-34(1951) Sept. 24.

The inelastic scattering of very slow neutrons by aluminum has been measured at four temperatures between 90 and 700°K. The results are compared with theory and found to agree within 10%. An appendix gives in compact form the theoretical formulas for the four scattering cross sections.

6897
PROTON-PROTON SCATTERING AT 146 Mev. J. M. Cassels, G. H. Stafford, and T. G. Pickavance. Nature 168, 468-9(1951) Sept. 15.

A proton beam of energy 146 Mev and a flux of 2×10^5 protons/cm²/sec was extracted from the 110-in. Harwell cyclotron by scattering the internal beam at a U target. The absolute cross section for p-p scattering was obtained through a comparison of the differential cross section at 90° with the cross section for the $C^{12}(p,pn)C^{11}$ reaction. The reaction was observed by irradiating a clear naphthalene crystal. The ratio of the two was found to be 0.0787 ± 0.0031 at an effective energy of 146 ± 1 Mev. Adopting Peterson's results of 63.4 ± 3.0 mb for the $C^{12}(p,pn)C^{11}$ cross section, the differential p-p cross section at 90° was calculated to be 4.99 ± 0.31 mb/steradian.

6898
MEASUREMENT OF SINGLE SCATTERING OF FAST ELECTRONS. H. Reich. Z. Physik 130, No. 2, 144-58 (1951). (In German)

The influence of multiple scattering on measurements of the single scattering of fast electrons at large scattering angles with inclination of the scattering foil to the primary beam is estimated. The scattering behavior observed from the incident side of the foil is very different from that observed on the exit side. Experiments with 2-Mev betatron electrons on polystyrene, Al, Cu, Ag, Sn, and Pt show that observations on the exit side are to be preferred for determination of the correction to the single-scattering cross section at angles up to 120°.

6899
CALCULATION OF THE RANGE-ENERGY RELATION OF HIGH-ENERGY PROTONS IN ILFORD C2 EMULSION. L. Vigneron. Compt. rend. 232, 1199-201(1951) Mar. 19. (In French)

The range of protons in Ilford C2 emulsions has been calculated from the energy-loss formula of Livingstone and Bethe (Revs. Modern Phys. 9, 245(1937)) by fitting to experimental results in the range 5 to 40 Mev and extrapolating to higher energies. Ranges are tabulated to 230 Mev.

RADIATION EFFECTS

6900
INFLUENCE OF RADIOACTIVITY ON THE THERMOELECTRONIC EMISSION OF CATHODES. Jean Debiesse, Georges Neyret, Jean Challansonnet, and Jacques Amoignon. Compt. rend. 232, 2015-16(1951) May 28. (In French)

Cathodes of Ni-5% Co, pure Ni covered with several microns of Co, or pure W, were pile-activated, and their thermoelectronic emissions were compared with those of unirradiated cathodes. Approximately 10^{13} thermal electrons were emitted for each β particle. In every case, the current in the tube containing the activated cathode was much weaker, corresponding to an increase in extraction potential. The radioactivity does not act solely by affecting the conductivity of oxide layers as thought previously.

RADIOACTIVITY

6901
Brookhaven National Lab.
THE DECAY OF Fe^{52}; by G. Friedlander and J. M. Miller. [nd] 4p. (AECU-1649)

The ratio of electron capture to positron emission in the decay of Fe^{52} has been determined as 1.6 ± 0.4. A proportional counter and pulse-height analyzer were used in a search for Mn K x rays resulting from electron capture, and an end-window G-M tube was used to determine the absolute positron disintegration rate. Decay curves indicated that at least 95% of the Fe^{52} decays go to the 21-min Mn^{52} isomer. The Fe^{52} decay proceeds by an allowed transition (log ft ≈4). A maximum positron energy of 640 ± 40 kev was deduced. It was concluded from scintillation spectrometer measurements that Fe^{52} emits no γ rays of energy greater than 0.5 Mev in appreciable abundance.

6902
Brookhaven National Lab.
TWO-STEP ISOMERIC TRANSITION IN Ba^{133m} (39 hr); by R. D. Hill, G. Scharff-Goldhaber, and M. McKeown. Aug. 31, 1951. 5p. (AECU-1643)

An argon-filled proportional counter and a single-channel pulse-height analyzer have been used in a search for a low-energy $d_{3/2} - S_{1/2}$ transition in Ba^{133m} following the 275.5-kev $h_{11/2} - d_{3/2}$ transition. Apart from the strong Ba K x-ray peak arising from the conversion of the 275.5-kev γ ray, the curve shows a peak due to a nuclear γ ray of 11.7 ± 0.2 kev which decayed with a half life of 39 hr. In addition, by the method of critical absorption the γ-ray energy was found to lie between the K-absorption edges of Ge (11.1 kev) and As (11.9 kev). By means of a NaI scintillation counter and an argon-filled proportional counter with pulse-height selector, coincidences were found between the 275.5-kev and the 11.7-kev γ rays. The coincidence rate was consistent with a total conversion coefficient of 130 for the 11.7-kev γ ray. An upper limit of 5×10^{-7} sec was established for the lifetime of the 11.7-kev excited state. Proposed disintegration schemes of 39-hr Ba^{133m} and ~10-yr Ba^{133} are shown.

6903
Palmer Physical Lab., Princeton Univ.
ON THE IDENTITY OF β-PARTICLES AND ELECTRONS; by E. D. Courant. June 15, 1951. 3p. (NYO-972)

The report is reproduced here in its entirety.

Suzor and Charpak (Compt. rend. 231, 1471(1950); 232, 322, 720(1951)) have measured the backscattering from thin

Al foils of conversion electrons from Tc^{99*} and In^{115*}, and of β radiation from Na^{22}, P^{32}, and Co^{60}. They plot the backscattering probability as a function of energy for the conversion electrons, and as a function of mean energy, assumed to be one-third the end point energy, for the β particles. The β curve lies well above the conversion electron curve, i.e., β particles with a given mean energy are scattered much more than conversion electrons of that energy. To make the two curves coincide it would be necessary to take for the abscissa of the β curve $\frac{1}{12}$, rather than $\frac{1}{3}$, of the end point energy. Suzor and Charpak interpret this result as indicating that β particles are different from electrons at the instant of emission from the nucleus, but presumably decay into electrons in flight or on passing through matter.

The experiment can also be explained by assuming that the backscattering of β particles is predominantly due to the low energy part of the spectrum. Suzor and Charpak reject this explanation on the basis of some measurements of Co^{60} with absorbers, which appear to show that the backscattering persists for β particles when the low energy part of the spectrum is eliminated. However, we shall see that the difference between the β and conversion curves can easily be explained in terms of the low energy portion of the β spectrum.

Let us assume, for simplicity, that in the relevant energy range the backscattering probability varies as $E^{-\alpha}$, where E is the kinetic energy of the electrons, and α is of the order of unity (this assumption is consistent with Suzor and Charpak's data on conversion electrons), and that the β spectrum is of the allowed type with a nonrelativistic end point:

$$N(E)\,dE = \text{const.}\ E^{\frac{1}{2}}(E_0 - E)^2\,dE, \qquad (1)$$

E_0 being the end point energy. The effective mean energy E_1 for backscattering is then given by

$$E_1^{-\alpha} = \left[\int_0^{E_0} E^{\frac{1}{2}-\alpha}\,(E_0 - E)^2\,dE \Big/ \int_0^{E_0} E^{\frac{1}{2}}\,(E_0 - E)^2\,dE\right] \qquad (2)$$

or

$$E_1/E_0 = \left[B\,(\tfrac{3}{2} - \alpha, 3)/B\,(\tfrac{3}{2}, 3)\right]^{1/\alpha}$$
$$= \left[(3 - 2\alpha)\,(5 - 2\alpha)\,(7 - 2\alpha)/3\cdot5\cdot7\right]^{1/\alpha} \qquad (3)$$

where B stands for the beta function. For $\alpha = 1$ we find $E_1/E_0 = \frac{1}{7}$; for $\alpha = 1.3$, $E_1/E_0 = 0.084$. If the latter value of α, which is quite plausible, is chosen and the corresponding energy taken as the effective energy of the β emitters studied by Suzor and Charpak, their two curves will coincide.

Their data without absorbers, therefore, does not contradict the identity of β particles and electrons. The measurements with absorbers may well be due to some more complicated, perhaps involving the γ radiation of Co^{60}.

6904

Radiation Lab., Univ. of Calif. and Rochester Univ.

NEUTRON-DEFICIENT ISOTOPES OF MERCURY; by Richard W. Fink and Edwin O. Wiig. [nd] 13p. (NYO-702)

Two new mercury isotopes, Hg^{192} and Hg^{193}, have been identified. Values for Hg^{192} are: $T_{\frac{1}{2}} = 5.7 \pm 0.5$ hr, 1.18-Mev β^+, 0.18-Mev conversion electrons, K and L x rays, and 1.39 Mev γ ray; parent of 4.0-hr Au^{192}. Those for Hg^{193} are: $T_{\frac{1}{2}} = 10.0 \pm 0.5$ hr, no β^+, K and L x rays, 0.18-Mev conversion electrons; parent of 15.3-hr Au^{193}. Preliminary studies tentatively identified Hg^{195} of 31-hr half life. Its genetic relationship has not been quantitatively established. No positrons are emitted, but K and L x rays and conversion electrons are observed. No activity was observed which can be allocated to Hg^{194}, and it is possible that Hg^{194} is β-stable. No evidence of 39.5-hr, positron-emitting Au daughter was observed among the Au daughter products. In proton bombardments of Au from 65 to 96 Mev, an unidentified 2.0-hr Hg activity was observed. This must have mass number 191 or lower.

6905

Illinois Univ. and Indiana Univ.

THE BETA-SPECTRUM OF La^{141}; by Robert B. Duffield and Lawrence M. Langer. [nd] 5p. (AECU-1666; LADC-1048)

The β spectrum of 3.7-hr La^{141} has been investigated using a lens spectrometer. The La^{141} was produced by decay of Ba^{141}, produced by slow-neutron fission of U^{235}. The Fermi plot of the data obtained is shown. There is a high-energy group with an end point at 2.43 ± 0.03 Mev (95%) and a lower energy group with an end point at ~0.91 Mev (5%). Inconclusive results of examination of γ radiation from La^{141} are stated. After the decay of the La^{141}, the γ rays from the Ce^{141} formed were examined with a scintillation counter. The 0.14-Mev γ ray was found, but no others were observed between 0.3 and 0.6 Mev. Prompt β-γ coincidences were found. A decay scheme is proposed for La^{141} and Ce^{141}.

6906

Ames Lab.

PREPARATION OF A 2.3-HOUR Ir^{197} BY A (γ,n) REACTION; by Darleane Christian, Russell F. Mitchell, and Don S. Martin, Jr. Oct. 9, 1951. 3p. (ISC-180)

Samples of $PtCl_4$ were irradiated with x rays of maximum energy 68 Mev. Ir was separated from the target as IrO_2 by chemical means. The IrO_2 contained an activity with a 2.3-hr half life and another with a 19-hr half life, corresponding to the well-known Ir^{194}. By absorption measurements the 2.3-hr β energy was estimated to be 1.0 Mev. The presence of 18.5-hr Pt^{197} in the IrO_2 fraction about 6 hr after cessation of irradiation indicated that Pt^{197} was formed as a daughter to the 2.3-hr activity, which was then assigned to Ir^{197}. An isomeric state of Pt^{197} may also have been formed. It is estimated that 16 times as much Pt^{197} was formed by the reaction $Pt^{198}(\gamma,n)\,Pt^{197}$ as Ir^{197} by $Pt^{198}(\gamma,p)Ir^{197}$.

6907

Argonne National Lab.

THE BINDING ENERGY OF FOUR NEUTRONS IN U^{239} AND THE DISINTEGRATION ENERGIES OF U^{239} AND Np^{239}; by J. R. Huizenga, L. B. Magnusson, M. S. Freedman, and F. Wagner, Jr. Aug. 21, 1951. Decl. Oct. 16, 1951. 3p. (AECD-3251; ANL-WMM-892)

The binding energy of four neutrons in U^{239} has been calculated as 22.19 Mev by summing the binding energies of one neutron in U^{239} (≥ 4.63), U^{238} (≤ 5.97), U^{237} (≥ 5.16), and U^{236} (≤ 6.43). The binding energy of a neutron in U^{239} and in U^{238} was measured by Huizenga et al. (Phys. Rev. 79, 908 (1950)), and that in U^{237} and U^{236} was calculated from the α energies of U^{235}, U^{236}, and U^{237} and the binding energy of a neutron in Th^{233} and Th^{232}. The sum of the disintegration energies of U^{239} and Np^{239} is calculated as 2.36 Mev from a cycle including the binding energy of four neutrons in U^{239} and the α-disintegration energy of Pu^{239}. The β spectra of U^{239} and Np^{239} were examined, and it was concluded that the U^{239} spectrum is simple, with a total disintegration energy of 1.295 Mev. For Np^{239} it was concluded that the 0.715-Mev β is the ground-state transition and the double β-decay energy is 2.01 Mev.

6908

Ames Lab.

POSITRON SPECTRA OF CERTAIN MIRROR NUCLEI; by F. I. Boley and D. J. Zaffarano. Oct. 11, 1951. 4p. (ISC-177)

The positron energy end points and half lives of the "mirror" nuclei Mg^{23}, Si^{27}, S^{31}, Cl^{33}, K^{37}, and Ca^{39}, produced

by (γ,n) and $(\gamma,2n)$ reactions, have been investigated. The disintegrations were detected by an anthracene scintillation spectrometer. Each disintegration detected was displayed in the form of a dot on an oscilloscope screen which was photographed on a rapidly moving film. The height of the dot above the base line was proportional to the amplitude of the light pulse produced by the scintillation crystal. An amplitude analysis of these dots provided an energy spectrum, and a time analysis yielded a decay curve. Values obtained for half lives and end-point energies, respectively, are: Mg^{23}, 12.3 ± 0.4 sec, 2.99 ± 0.09 Mev; Si^{27}, 5.4 ± 0.4 sec, 3.48 ± 0.10 Mev; S^{31}, 3.2 ± 0.3 sec, 4.06 ± 0.12 Mev; Cl^{33}, 1.8 ± 0.1 sec, 4.43 ± 0.13 Mev; K^{37}, 1.2 ± 0.2 sec, 4.57 ± 0.13 Mev; Ca^{39}, 1.1 ± 0.2 sec, 5.13 ± 0.15 Mev.

6909

RADIOACTIVE I^{122}. John N. Young, M. L. Pool, and D. N. Kundu. Phys. Rev. 83, 1060-1(1951) Sept. 1 (Letter to the editor)

When Te was bombarded with 7.4-Mev protons, a 3.6-min positron activity and the 25-min negatron activity of I^{126} were observed in the ratio 1/.4. Bombardment of Te enriched to 79.4% Te^{122} yielded the same activities in the ratio 46.5/1. The 3.6-min activity must then be attributed to either I^{122} by the (p,n) reaction or to I^{123} by the (p,γ) reaction. Examination of the relative branching of these two reactions in neighboring Te isotopes led to the conclusion that the 3.6-min activity should be assigned to I^{122}. By absorption measurements the maximum energy of the positron spectrum was found to be 3.08 ± 0.1 Mev.

6910

A SEARCH FOR EMISSION OF ELECTRON PAIRS FROM NUCLEI. G. C. Phillips, D. B. Cowie, and N. P. Heydenburg. Phys. Rev. 83, 1049-50(1951) Sept. 1. (Letter to the editor)

The (p,α) process for F^{19} is known to yield electron pairs from a 6.05-Mev excited state of O^{16}. Electron pairs that might result from the residual nuclei of other (p,α) disintegrations were sought using anthracene crystals in coincidence and 5819 photomultipliers for detectors. Thick targets of B, Na, Al, and P were bombarded with 1.55-Mev protons; no true coincidences of soft radiation could be detected. A 7.9-Mev collimated proton beam was used to bombard thick targets of Li, Be, Al, Ag, elemental enriched B^{10}, normal B, and C. B^{11} produced a soft, true coincident radiation that could not be due to β-γ or γ-β radioactivity (>10^{-8}-sec half life) nor to γ rays producing pairs of electrons. This soft coincident radiation may indicate a pair-emitting state in Be^8 which would not be expected to have even parity and hence would have a considerably different character than the state in O^{16}.

6911

THE ALPHA RADIOACTIVITY OF NATURAL BISMUTH. Henriette Faraggi and André Berthelot. Compt. rend. 232, 2093-5(1951) June 4. (In French)

Ilford C2 nuclear emulsions were impregnated with 0.27 g of Bi/cm³ and preserved for 2 yr and 3 months at 4°C. Observation of the tracks in the developed emulsion favors the existence of an α radioactivity for natural Bi^{209} of 2.7×10^{17}-yr half life and 3.15-Mev energy.

6912

MEASUREMENT OF THE RATIO OF U^{235} AND U^{234} ACTIVITIES IN NATURAL URANIUM WITH A GRID IONIZATION CHAMBER. Gabriel-Jacques Sayag. Compt. rend. 232, 2091-3(1951) June 4. (In French)

The ionization chamber and technique are described briefly. The ratio of U^{235} to U^{234} counts measured is 4.08 ±0.15% which becomes 4.55 ± 0.21% if the existence of a U^{235} α group of 4.576-Mev energy and making up 10 ± 1% of the total activity is taken into account. The half life of U^{235} deduced from these measurements is 7.07×10^8 yr.

SHIELDING

6913

Pupin Physics Labs., Columbia Univ.

BORON CARBIDE BRICKS FOR SLOW NEUTRON SHIELDS AND SINKS; by C. Sheer and J. Tittman. Nov. 24, 1950. 5p. (CUD-60)

A method is described for compacting B_4C powder into small bricks of reasonable mechanical strength and with densities as high as 1.8 g/cm³. Although the bricks are fairly brittle, frequently breaking on impact, they are sufficiently strong to be cemented to wood or metal backings and to one another with shellac or similar adhesive. They have been made at a cost about 1/10 that of commerically available sintered B_4C bricks. The recipe used in making the bricks is given. Approximately 400 such bricks (2 in. by 3 in. by 1 in. and 4 in. by 5 in. by ½ in.) have been made and after use for 18 months under conditions of relatively high humidity still adhere firmly to their backing and show no signs of deterioration. The bricks can be cut to shape with a waterless diamond wheel, and the softer ones (low B_2O_3 content) can be cut with a carborundum wheel.

SPECTROSCOPY

6914

CALCULATION OF THE RYDBERG CORRECTION FOR SINGLY EXCITED LITHIUM, P- AND D-STATES. Erling Holoien. Arch. Math. Naturvidenskab 51, No. 1, 1-19(1951).

The variational method is applied to calculations of the P and D states of singly excited Li. The Rydberg corrections due to Coulomb attraction, screening, and exchange are given, and the main contributions to the Rydberg correction from polarization are calculated. Both the K shell and the L shell are displaced toward the nucleus by increasing nuclear charge, the L shell with a single electron more distinctly than the K shell. In this way the effect due to screening, Coulomb attraction, and exchange always increases while the polarization effect first increases and later decreases.

6915

THE SPECTROCHEMICAL ANALYSIS OF AIR-BORNE DUSTS FOR BERYLLIUM. L. E. Owen, J. C. Delaney, and C. N. Neff. Am. Ind. Hyg. Assoc. Quart. 12, 112-14(1951) Sept.

A spectrochemical method for the determination of Be and its compounds in dusts and fumes is described. Two main types of samples are prepared for spectrographic analysis: one type is prepared by drawing a measured quantity of air through filter paper; the second type differs from the first in utilizing electrostatic precipitation rather than filtration. Two slightly different methods are used to obtain solutions representing the dusts retained on the dry filter paper. In one method, the samples are dry-ashed and in the other, wet-ashed. The solutions are then excited in porous cup electrodes and the spectra photographed in the 2480 to 3700 A region. The precision of the method on duplicate samples is about 3.5%.

THEORETICAL PHYSICS

6916

Case Inst. of Tech.

SECOND-QUANTIZED THEORY OF SPIN ½ PARTICLES IN NONRELATIVISTIC LIMIT (thesis) (Technical Report No. 10); by Richard Kent Osborn. [nd] 54p. (AECU-1662)

The second-quantized Dirac Hamiltonian for free electrons is transformed by a canonical transformation to a repre-

sentation in which the positive- and negative-energy wave operators are separately represented by two-component operators. The transformation employed is the second-quantized analogue of the one derived by Foldy and Wouthuysen (Phys. Rev. 78, 29-36(1950)) in their discussion of the one-particle Dirac theory and its nonrelativistic limit. This transformation is then applied to the wave operators and the Hamiltonian in the second-quantized, charge-conjugate formalism for Dirac particles. The wave operators for positrons and electrons become linearly independent two-component operators, and the Hamiltonian separates into an electron and a positron part, each of which contains only the corresponding two-component wave operators. It is shown that by means of an appropriate, readily determinable sequence of canonical transformations, Hamiltonians for fields of spin-½ particles interacting via intermediary fields can also be reduced to nonrelativistic form. This is accomplished by transforming the Hamiltonian to a representation in which it is exhibited effectively as a series expansion in powers of the reciprocal of the Compton wavelength of the spin-½ particle. Illustration of the method is provided by detailed examination of the case of nucleons interacting via the pseudoscalar meson field. (auth)

6917

Brookhaven National Lab.

ON THE EIGENVALUE PROBLEM IN QUANTUM ELECTRODYNAMICS; by Maurice Neuman. Sept. 11, 1951. 17p. (AECU-1641)

The eigenvalue problem in quantum electrodynamics is discussed from the point of view of the Fredholm theory of integral equations. Starting with positron theory—the theory of a quantized Dirac field interacting with an external field only—the external potentials are replaced by bare photon fields. To insure causality the photon operators are ordered in time. Certain integral equations for the Fredholm minors constructed on the Feynman kernel are taken to be the equations for the wave functions of n-particle systems. An expansion in interaction patterns rather than the coupling constant is indicated. The one-particle problem is treated in the first pattern approximation. Procedures proposed by Snyder and Snow (Phys. Rev. 80, 987(1950)) and the mass renormalization schemes are discussed in this connection. Finally a purely formal derivation of the Bethe-Salpeter equation for the two-body problem in the lowest pattern approximation is given. (auth)

6918

THEORY OF MULTIPOLE RADIATIONS. P. R. Wallace. Can. J. Phys. 29, 393-402(1951) Sept.

A systematic analysis of the radiation from a given oscillating system of charges and currents is developed without any approximations. Using a simple vector identity, the vector potential is separated into irrotational and solenoidal parts. The field may be expressed in terms of the latter alone. A similar vector identity involving the operator $\underline{L} = \underline{r} \times \text{grad}$ (the rotation operator) permits the separation of the field into parts in which the radial components of the electric and magnetic field, respectively, vanish. The energy flux, energy density, and angular momentum density may in each case be expressed in terms of the angular operators $\underline{L}$, $\underline{L}^2$. Expansion in the eigenfunctions of these operators, the spherical harmonics, corresponds to the separation into electric and magnetic multipoles of all orders. Introduction of "tensor spherical harmonics" enables these radiations to be exhibited in terms of natural multipoles (derivatives of $1/r$). All calculations are carried out without restriction as to size of radiating system relative to wavelength, in the induction as well as the radiation region. (auth)

6919

THE CREATION OF ELECTRON-POSITRON PAIRS IN COLLISION PROCESSES BETWEEN PARTICLES OF SPIN $\hbar/2$. Gérard Petiau. Compt. rend. 232, 1910-12(1951) May 21. (In French)

Positron theory has been applied to calculation of the differential cross section for pair creation in collisions between two Dirac particles of spin $\hbar/2$ initially and finally in the free state and represented by plane waves.

6920

ON THE POSSIBILITY OF A COMPLEX STRUCTURE FOR PARTICLES OF SPIN DIFFERENT FROM ½. Louis de Broglie. J. phys. radium 12, 509-16(1951) Apr. (In French)

Reasoning from the case of a particle of spin 1 considered as two constituents of spin ½, the author shows how the movement of the center of gravity of the particle may be separated from the "internal" movement, and develops solutions relative to the internal movement. The method of transferring to the center of gravity the spin properties of the ensemble and from this finding the known equations of particles of spin 1 is developed. Generalization to particles of spin greater that 1 is possible.

6921

STUDY OF THE SYSTEM FORMED BY THE UNION OF TWO DIRAC PARTICLES. Marie-Antoinette Tonnelat. J. phys. radium 12, 516-20(1951) Apr. (In French)

The possible solutions of the equation for the system of two Dirac particles of the same mass are derived for the center-of-gravity system. One solution describes a singular, the other a triplet state.

PATENTS

CHEMISTRY

6922

PREPARATION OF ORGANIC MATERIALS. A. Murray III and A. R. Ronzio (to U. S. Atomic Energy Commission). U. S. Patent No. 2,571,926, Oct. 16, 1951.

A process for the preparation of urea or cyanamide comprises the steps of reacting barium carbonate with barium amide to form barium cyanamide, hydrolyzing the latter to form cyanamide, and in turn urea. By using CO_2 formed from C^{14} to prepare the barium carbonate, it is possible to prepare C^{14}-labeled urea.

6923

PROCESS FOR PRODUCTION OF RADIOACTIVE IRON. J. A. Swartout (to U. S. Atomic Energy Commission). U. S. Patent No. 2,571,965, Oct. 16, 1951.

This patent covers a process for producing a radioactive iron composition of high specific activity. The composition is obtained as the water-insoluble fraction from magnesium ferrocyanide which has been subjected to neutron bombardment in only a low or moderate neutron flux.

6924
CATALYTIC VAPOR PHASE FLUORINATION APPARATUS. F. B. Downing and J. B. Roberts (to U. S. Atomic Energy Commission). U. S. Patent No. 2,570,435, Oct. 9, 1951.

A chamber with inlets for reactants at one end and an outlet for reaction products at the other end contains a gas-permeable contact mass and a permeable plate interposed between the inlets extending a substantial distance into the contact mass and having perforations of progressively larger size in the direction of gas flow in the chamber.

6925
ADSORPTION SEPARATION OF ZIRCONIUM AND HAFNIUM. R. S. Hansen (to U. S. Atomic Energy Commission). U. S. Patent No. 2,571,237, Oct. 16, 1951.

The patent covers a process for separation of Hf from Zr by passing a mixture of the anhydrous chlorides in solution in anhydrous methanol through a bed of silica gel, whereby the Hf is substantially completely adsorbed. (See also NSA 4-4837)

6926
FLUORINATION OF HIGH MOLECULAR COMPOUNDS. A. F. Benning (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,759, Sept. 11, 1951.

Fluorocarbon lubricant oils are obtained from high boiling hydrocarbon oils by passing the vapor of the hydrocarbon oil and larger volume of gaseous HF into contact with a fluorinating agent such as CoF_3 at a temperature between 150 and 400°C.

6927
ZIRCONIUM AND HAFNIUM RECOVERY AND PURIFICATION PROCESS. J. A. Ayers (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,661, Sept. 11, 1951.

This patent covers a process for obtaining an effluent of Zr or Hf composition substantially free of undesired metal nitrates. Impure zirconyl or hafnyl nitrate or mixtures thereof may be freed from contaminating metal nitrates by diluting with water so as to form hydrous oxides of the Zr or Hf and then passing the diluted composition through a bed of cation-exchange resin.

6928
METHOD OF PREPARING URANIUM PENTAFLUORIDE. C. J. Carignan (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,145, Sept. 4, 1951.

A process is given for preparing UF_5 by reacting anhydrous hydrofluoric acid with UCl_5 or UCl_6 or mixtures thereof at room temperature or below, subsequently pumping off the excess reactive gas and product gases and recovering solid anhydrous product.

6929
PREPARATION OF BERYLLIUM NITRIDE. A. S. Langsdorf, Jr. (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,518, Sept. 11, 1951.

Be_3N_2 of high density is prepared at a controlled rate by reacting finely divided Be metal with gaseous N_2 containing 2 to 6% H_2 by volume at a temperature between 700 and 1400°C.

6930
ELECTROLYTIC PROCESS FOR PRODUCTION OF FLUORINE. G. C. Whitaker (to U. S. Atomic Energy Commission). U. S. Patent No. 2,506,438, May 2, 1950.

This process for electrolytic production of F employs a steel cathode and an anode composed of carbon containing 35 to 47% of Cu distributed in the form of a network throughout the C in a mixed electrolyte at specified temperatures.

6931
ORGANIC FLUORINE COMPOSITION AND METHOD OF MAKING. F. B. Stilmar (to U. S. Atomic Energy Commission). U. S. Patent No. 2,569,644, Oct. 2, 1951.

The process of this patent produces a highly fluorinated high-boiling oil. Trichlorotrifluoroethane is condensed in liquid phase at an elevated temperature by means of a Cu condensing agent. A portion of the reaction product, obtained by fractional distillation is subsequently additionally fluorinated by means of SbF_5, CoF_3, or the like.

6932
PRODUCTION OF DICHLORODODECAFLUOROHEPTANE AND DERIVATIVES THEREOF. K. W. Krantz (to U. S. Atomic Energy Commission). U. S. Patent No. 2,568,642, Sept. 18, 1951.

A polychloroheptane composition containing 10 to 12 Cl atoms per molecule is fluorinated by treatment with anhydrous SbF_5. The reaction product is distilled to obtain a fraction having a composition approximating dodecafluoroheptane. This separated fraction is then photochemically chlorinated in liquid phase by means of gaseous Cl to a Cl content of about 20% by weight. The reaction product is fractionally distilled to obtain dichlorododecafluoroheptane.

6933
FLUORINATION PROCESS. R. Rosen (to U. S. Atomic Energy Commission). U. S. Patent No. 2,568,660, Sept. 18, 1951.

This process employs powdered CoF_3 in a fluidized technique for producing highly fluorinated carbon compounds from a hydrocarbon such as heptane.

6934
METHOD OF FORMING URANIUM MONOCARBIDE. J. H. Carter and A. H. Daane (to U. S. Atomic Energy Commission). U. S. Patent No. 2,569,225, Sept. 25, 1951.

UC is produced by combining metallic U with C in an amount of about 4.8% by weight and heating the mixture to a temperature in the range of about 900 to 1125°C to bring about the reaction.

ENGINEERING

6935
AMBIENT PRESSURE RESPONSIVE CLAMPING MEANS. A. J. Reyenga (to U. S. Atomic Energy Commission). U. S. Patent No. 2,570,984, Oct. 9, 1951.

A quick-release clamping means is actuated in dependence with ambient pressure conditions and is particularly adapted to support a target to be bombarded by accelerated particles in an evacuated chamber.

6936
PRESSURE MONITORING DEVICE. R. Livingston (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,519, Sept. 11, 1951.

A pressure-monitoring device, particularly adapted for use with highly corrosive gases, is so arranged that the pressure of the reactive gas is automatically balanced by a nonreactive gas, the pressure of which is directly measured. This system can also be used to control the pressure of the reactive gas.

6937
DRILL TOOL. A. P. Hatcher (to U. S. Atomic Energy Commission). U. S. Patent No. 2,569,854, Oct. 2, 1951.

This rotary drill tool for cutting glass or the like acts to provide a pumping action whereby liquid carrying the abrasive is continuously supplied to the cutting edge of the tool.

6938
ROTARY SHAFT DRIVEN TAPPET. Q. J. Evans (to U. S. Atomic Energy Commission). U. S. Patent No. 2,568,061, Sept. 18, 1951.

This patent provides a simple, delayed action tappet responsive to starts and stops in the rotation of a shaft, by mounting thereon a lubricated freely rotatable sleeve bearing employing suitable lever arms, and other desired mechanical components.

MINERALOGY, METALLURGY, AND CERAMICS

6939

RECOVERY OF CARNOTITE FROM ITS ORES. R. W. Handley and C. W. Sawyer (to U. S. Atomic Energy Commission). U. S. Patent No. 2,570,119, Oct. 2, 1951.

In a process for recovering a carnotite concentrate from siliceous carnotite bearing ores, the ground ore is subjected to flotation in the presence of a long-chain fatty acid of at least 10 carbon atoms and a high-molecular-weight primary aliphatic amine of at least 8 carbon atoms.

6940

PROCESS FOR RECOVERY OF PITCHBLENDE AND SIMILAR URANIUM MINERALS FROM ORES OF SAME BY SPECIAL FLOTATION PRACTICE. R. W. Handley and C. W. Sawyer (to U. S. Atomic Energy Commission). U. S. Patent No. 2,570,120, Oct. 2, 1951.

In a process for recovering a pitchblende concentrate from a siliceous ore thereof, a preliminary treatment of the wet ground ore with ferric chloride is followed by flotation of the ore pulp at a pH of about 7.5 to 8 in the presence of a long-chain fatty acid containing at least 10 carbon atoms and a primary aliphatic amine containing at least 4 carbon atoms.

PHYSICS

6941

SAMPLER FOR HIGHLY RADIOACTIVE SUBSTANCES. W. Q. Smith (to U. S. Atomic Energy Commission). U. S. Patent No. 2,571,302, Oct. 16, 1951.

This sampling apparatus is designed to provide adequate shielding for an operator when treating or handling solutions of very high radioactivity.

6942

SYSTEM FOR DETERMINING TUBE CHARACTERISTICS. F. M. Glass (to U. S. Atomic Energy Commission). U. S. Patent No. 2,571,439, Oct. 16, 1951.

This patent discloses an electronic system for determining the characteristics of radiation-responsive devices and is particularly adapted to automatic plotting of the characteristic rise curve of a G-M tube.

6943

APPARATUS FOR THE MEASUREMENT OF RADIOACTIVITY. J. Hecomovich (to U. S. Atomic Energy Commission). U. S. Patent No. 2,567,668, Sept. 11, 1951.

A radioactivity measuring apparatus, suitable for assaying by fission counting, is provided with an arrangement of safety devices to protect the operator from dangerous radiation and high voltage.

6944

CARRIER FOR RADIOACTIVE SLUGS. G. Strickland (to U. S. Atomic Energy Commission). U. S. Patent No. 2,514,909, July 11, 1950.

A carrier for radioactive slugs employs a rotatable magazine and is so arranged that individual loading and unloading may be accomplished while maintaining adequate shielding.

6945

ELECTRICAL SIMULATOR. E. J. Wade and J. W. Simpson (to U. S. Atomic Energy Commission). U. S. Patent No. 2,569,646, Oct. 2, 1951.

This electrical simulator is designed to solve simultaneous partial differential equations such as neutron diffusion equations.

6946

FILTER. R. DeLiban (to U. S. Atomic Energy Commission). U. S. Patent No. 2,569,232, Sept. 25, 1951.

An electronic filter circuit which may be synchronized to pass any one of a number of frequencies is capable of selecting a signal of desired frequency from others only a few cycles removed to provide a high signal to noise ratio, thus establishing a higher available sensitivity.